

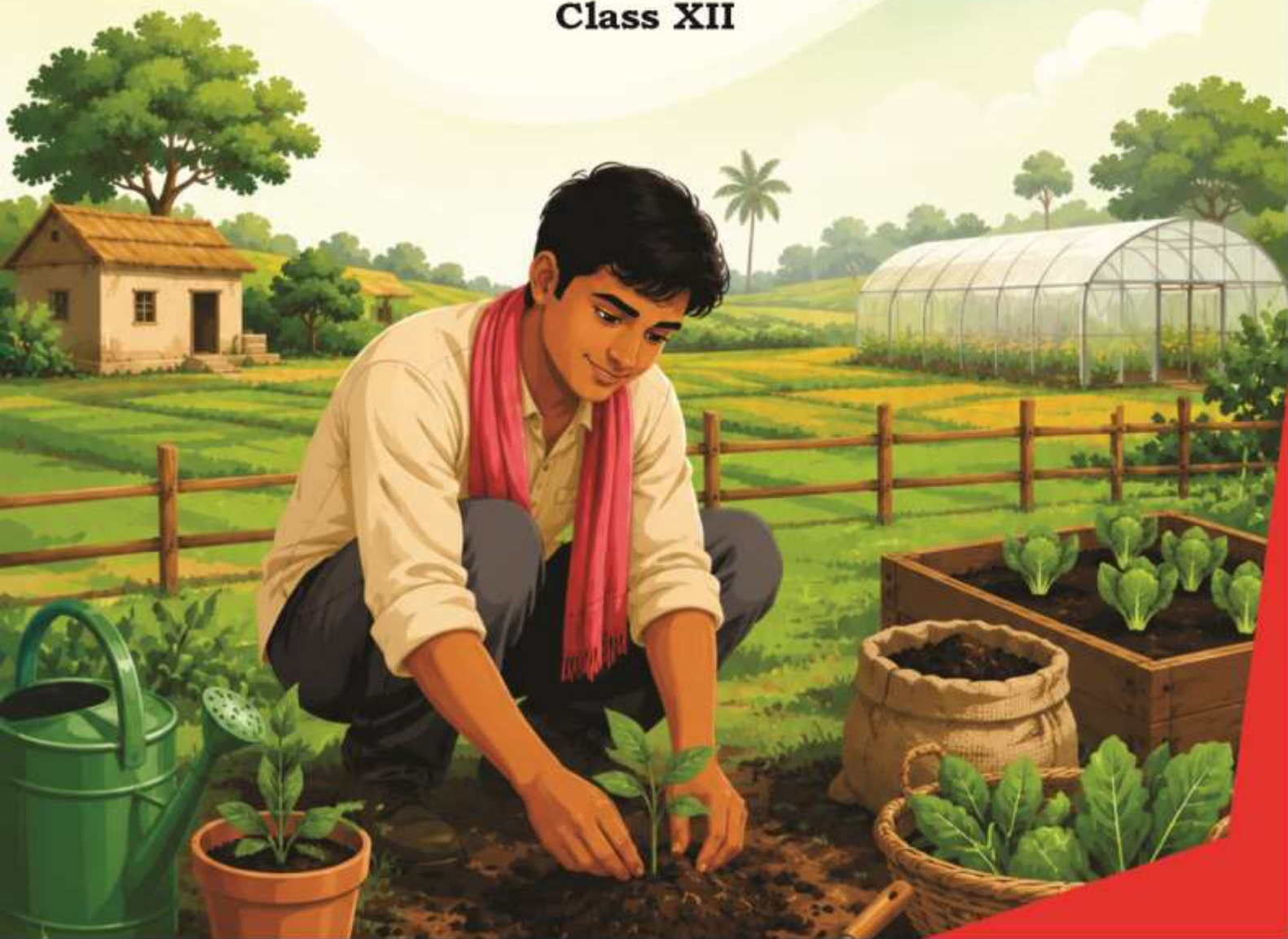
Draft Study Material

ORGANIC GROWER

Qualification Pack Code: AGR/Q1201

Sector: Agriculture

Class XII



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NCERT

PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION

(A constituent unit of NCERT, under Ministry of Education, Government of India)

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DRAFT STUDY MATERIAL

JOB ROLE: ORGANIC GROWER

QP CODE: AGR/Q1201

SECTOR: AGRICULTURE

CLASS XII

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PREFACE

Skill Education is a dynamic and evolving field, and ensuring that every learner has access to quality learning resources is of paramount importance. The absence of finalised study material should not hinder the educational progress of students in the schools. To address this need, the PSS Central Institute of Vocational Education (PSSCIVE) presents this Draft Study Material, a provisional yet comprehensive resource, designed to support the teaching-learning process until the official study materials or textbooks are released by the National Council of Educational Research and Training (NCERT).

This draft study material provides a structured, accessible, and curriculum-aligned framework for both teachers and students during the interim period. The content has been carefully developed to ensure continuity in learning and to help students achieve the prescribed learning outcomes. The content of the draft study material covers essential concepts, practical competencies, and skill-based knowledge in accordance with the curriculum and established educational standards.

The primary objective of this material is to sustain the momentum of skill education and facilitate effective classroom transactions while the finalised textbooks are under preparation. It serves as a guiding resource that can be adapted and enriched to meet the diverse learning needs of students.

We express our sincere gratitude to the academicians, educators, subject matter experts, industry professionals, academic consultants, and all other contributors whose expertise and valuable insights have made the development of this draft study material possible.

Teachers are encouraged to use this draft study material as a guiding resource and to supplement them with additional learning materials, practical activities, and contextual examples that cater to the unique needs and learning styles of their students. We welcome constructive feedback and suggestions, particularly from teachers and practitioners, to further enhance the content and effectiveness of this study material.

We hope that this draft study material serves as a valuable resource in fostering knowledge, skills, and employability among learners, while supporting the successful implementation of skill education programmes across the country.

Deepak Paliwal
Joint Director
PSS Central Institute of Vocational Education

03 August 2026
Bhopal

ABOUT THE BOOK

Organic agriculture is a sustainable farming system that focuses on producing crops and livestock without the use of synthetic fertiliser, pesticides, herbicides, or genetically modified organisms.

The *Organic Grower* book for Class XII provides a comprehensive understanding of organic farming practices, focusing on harvesting, post-harvest management, certification systems, and marketing of organic produce. It is designed to develop both theoretical knowledge and practical skills required for sustainable agriculture.

Unit 1 on *Harvesting and Post-Harvest Management* introduced to the importance of harvesting crops at the correct stage of maturity to ensure quality and maximum yield. The unit also describes various harvesting methods, including manual and mechanical techniques, emphasising care to avoid damage and maintain organic integrity.

Unit 2 on *Standards and Certification in Organic Farming* deals with the regulatory framework that ensures the authenticity of organic products. It outlines national standards that prohibit synthetic fertiliser and pesticides while promoting organic soil management practices. The certification process includes farm inspection, compliance checks, and a conversion period from conventional to organic farming.

Unit 3 on *Marketing of Organic Produce* explains how organic products are promoted and sold in the market. It describes different types of organic farming enterprises, including small farms, cooperatives, and commercial ventures, along with government policies and regulations that support them. The unit also highlights various organisations and agencies, including government bodies, NGOs, and farmer producer organisations, that support the marketing and development of organic produce.

The book integrates scientific concepts with practical applications, enabling learners to acquire the knowledge, skills, and professional competencies required for successful organic farming. It prepares students to adopt sustainable agricultural practices, comply with organic certification standards, minimise post-harvest losses, and effectively market organic produce, thereby contributing to environmentally responsible agriculture, improved rural livelihoods, and sustainable economic development.

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PSSCIVE places on record its special appreciation to Dr. Satendra Arya, Chief Executive Officer, Agriculture Skill Council of India (ASCI) for his invaluable support in the development of the Qualification Pack (QP) for the job role of Organic Grower. His expertise and continued involvement significantly contributed to strengthening the competency standards that form the foundation of the curriculum and the books.

PSSCIVE also gratefully acknowledges the valuable contributions of the subject experts for their technical inputs, and support in the development of this book.

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Unit 1

Harvesting and Post-Harvest Management

Unit 1 on *Harvesting and Post-Harvest Management* introduces you to the important principles and practices involved in harvesting and post-harvest management of agricultural produce. You will learn how proper harvesting at the right stage and time helps in maintaining the quality, nutritional value, and marketability of crops. The unit also familiarises you with different harvesting methods, post-harvest operations, and innovative storage practices that help reduce losses and extend the shelf life of produce.

Session 1 on *Factors Affecting Harvesting and Stages of Crop Maturity* introduces you to the ideal stage of harvesting for different crops to maximise quality and minimise losses. You will also learn about the factors affecting harvesting, such as climatic conditions, market distance, and the selection of suitable harvesting equipment.

Session 2 on *Methods and Techniques of Harvesting*, familiarises you with various harvesting methods and techniques used for different crops and scales of farming. You will understand the importance of selecting appropriate harvesting practices for efficient crop management.

Session 3 on *Post-Harvest Handling and Management Practices*, introduces you to important post-harvest operations such as grading, trimming, drying, pre-storage treatment, and quality control practices that help maintain product quality and extend shelf life.

Session 4 on *Innovative Storage Practices for Organic Produce*, explains modern and appropriate storage practices for organic produce. You will learn how proper storage methods help retain the nutritional quality, freshness, and market value of harvested crops.

Session 1: Factors Affecting Harvesting and Stages of Crop Maturity

Harvesting is a critical stage in the agricultural production process, and its timing and execution significantly influence the quality and yield of the produce. Understanding the factors that determine the ideal time for harvesting and the different stages involved is essential for optimising the quality of organic crops.

The major factor determining the time of harvest is crop maturity. Other factors, such as weather, availability of harvest equipment, pickers, packing and storage facilities, and transport, are important considerations.

1. Maturity and Ripening in Crops

Maturity and ripening are two crucial processes in the growth and development of crops, especially in agriculture, where timing these stages correctly ensures optimal quality and yield. While these terms are often used interchangeably, they refer to different stages in the lifecycle of crops, particularly fruits and vegetables.

- a) **Maturity:** It refers to the point when a crop has fully developed to the extent that it is capable of being harvested. It signifies the stage at which the crop has reached its full size, weight, and nutritional content, and is physiologically ready for harvest (Fig. 1.1). Maturity varies depending on the type of crop, but in general, it involves the following characteristics:
- **Physical development:** The crop reaches its full size, shape, and weight, and is free from external damage or stress. For example, in fruits such as tomatoes, maturity is often marked by a change in colour, while root crops like potatoes, it is indicated by the fullness and size of the tuber.
 - **Nutritional content:** At maturity, the crop contains the highest levels of nutrients, sugars, starches, and proteins that are characteristic of that species. In many crops, harvesting too early or too late can lead to poor nutritional quality or underdevelopment.

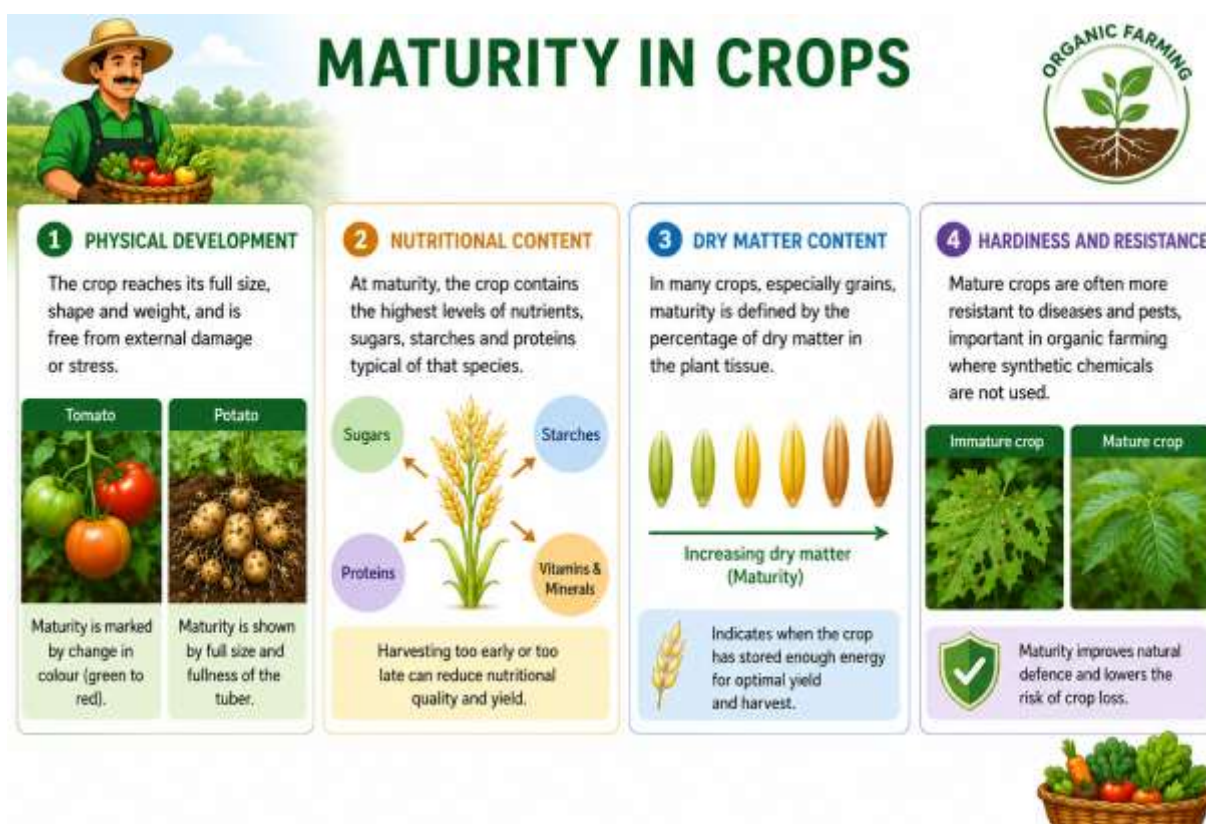


Fig. 1.1: Maturity and its important indicators in crops

- **Dry matter content:** In many crops, especially grains, maturity is often defined by the percentage of dry matter in the plant tissue. This indicates when the crop has stored enough energy for optimal yield and harvest.
 - **Hardiness and resistance:** The susceptibility of crops to pests and diseases varies with crop type and stage of development. Some mature crops may show improved tolerance, while others become more vulnerable to infestation and post-harvest diseases.
- b) **Ripening:** It is the process that occurs after the crop has reached maturity and continues until the fruit or vegetable reaches the desired stage for consumption. Ripening occurs mainly in fruits and some vegetables and involves biochemical changes that improve flavour, texture, and aroma. Key factors in ripening include:
- i. **Biochemical changes:** During ripening, enzymes break down starches into sugars, making the fruit sweeter. Acid content decreases, and the flavour compounds develop. For example, as bananas ripen, starch is converted to sugar, giving them their sweet taste.
 - ii. **Colour change:** Ripening often involves a colour change in fruits. For example, the green chlorophyll in tomatoes breaks down, and the fruit turns red as it ripens. The colour change signals that the fruit is ready for consumption or the market.
 - iii. **Texture and firmness:** As fruits ripen, their texture softens due to the breakdown of cell walls. This is particularly important for crops like peaches, mangoes, and bananas, where the flesh becomes tender and more palatable as the fruit ripens.
 - iv. **Aroma development:** Ripening also leads to the production of aromatic compounds that give fruits their characteristic smell. This is especially important for crops like apples, melons, and citrus, where fragrance plays a significant role in consumer preference.
 - v. **Ethylene gas:** In many fruits, ripening is influenced by the production of ethylene gas, a natural plant hormone that regulates the ripening process. Ethylene is used commercially to control the ripening of fruits such as bananas.

2. Factors Affecting Maturity of Crops

The maturity of crops is a critical stage in the growth cycle, as it determines the optimal time for harvest to achieve the best quality and yield. Several factors influence the rate and timing of maturity, and understanding these factors is crucial for successful crop management. Below are the key factors that affect the maturity of crops:

- i. **Genetic makeup:** The genetic characteristics of a plant play a major role in determining its time to maturity. Different crop varieties have different

maturation periods. For example, early-maturing varieties of corn or tomatoes will reach maturity faster than late-maturing varieties.

- ii. **Hybrid varieties:** They are often bred for specific traits such as early maturity, pest resistance, and high yield, which can affect the timing of maturity.
- iii. **Soil fertility:** It plays an essential role in crop development. Crops growing in nutrient-rich soil often mature faster, with better quality and higher yields. The availability of key nutrients such as nitrogen, phosphorus, and potassium influences plant growth and the time to maturity.
- iv. **Temperature:** Higher temperatures generally accelerate crop development and reduce the time required for maturity. Lemons and guavas take less time to mature in summer than in winter. Sun-scorched portions of fruits are characterised by chlorophyll loss, yellowing, disappearance of starch and other alcohol-insoluble material, increase in TSS (Total Soluble Solids) content, decrease in acidity and softening.
- v. **Water supply and irrigation:** Water stress can either delay or hasten the maturity of crops. Inadequate water supply can cause early maturation with reduced yields, while proper irrigation helps crops reach full maturity at the desired time. Proper irrigation management can help optimise the crop growth cycle, promoting timely maturity. Stressing crops near maturity, like withholding water slightly, may lead to better quality produce, especially in fruits and vegetables.
- vi. **Pest and disease pressure:** Pests such as insects, rodents, or other harmful organisms can damage crops at various stages of growth, affecting the plant's ability to mature properly. Heavy pest infestation may cause stunted growth, premature flowering, or premature fruiting. Fungal, bacterial, or viral infections can interfere with crop maturation by weakening the plant. Crops suffering from diseases may show delayed maturity or fail to mature properly, leading to poor-quality harvests.
- vii. **Nutrient management:** The availability and uptake of essential nutrients during the growing season are vital for the timely maturation of crops. A lack of essential nutrients like nitrogen, phosphorus, or potassium can cause delayed maturity or poor-quality produce. Over-fertilisation, particularly with nitrogen, can also delay maturity, leading to excessive vegetative growth at the expense of fruit or seed development.
- viii. **Crop management practices:** Proper crop management practices, such as pruning, thinning, and crop rotation, can affect the timing of maturity. Thinning overcrowded plants or pruning deadwood allows the remaining plants to grow more efficiently and mature faster. Weeds compete with crops for nutrients, water, and sunlight, which can delay the maturation process. Effective weed control through mulching, mechanical weeding, cultural practices, or manual removal ensures that crops have optimal conditions for timely maturation.

3. Maturity Indices

These are the signs or indications of the readiness of the commodity for harvest. It is the basis for determining the harvest date. The maturity of harvested perishable

commodities has an important bearing on their storage life and quality and may affect the way they are handled, transported, and marketed. Various maturity indices include the number of days from fruit set, visual indicators, size of fruits, shape of fruit, colour of fruit, appearance (external), texture, lenticel number (Lenticels are small, spongy openings on the stems, branches, or fruits of plants that allow for gas exchange between the internal tissues and the air), specific gravity, starch content, soluble solids, sugar acid ratio, oil contents and many more.

4. Importance of Maturity Indices

The proper maturity of agricultural and horticultural commodities at harvesting is very important. The harvesting of commodities at an improper stage results in monetary losses and also affects the post-harvest life. Fruit harvested too early or too late is more prone to post-harvest physiological disorders and diseases than fruit picked at the proper maturity stage. Apples picked late (126 Days after full bloom) were found to be more sensitive to rot, with a mean rot incidence of 76.21%. Different post-harvest diseases were noticed due to late harvesting, whereas early harvesting resulted in minimal rotting of fruits (12.81%). The optimal harvest stage raises the possibility of harvested fruits being less predisposed to rot and post-harvest diseases. Some typical maturity indexes are described in the following sections (Fig. 1.2):

- i. **Skin colour:** This factor is commonly applied to fruits, since skin colour changes as fruit ripens or matures. Some fruits exhibit no perceptible colour change during maturation, depending on the type of fruit or vegetable. Assessment of harvest maturity by skin colour depends on the judgment of the harvester, but colour charts are available for cultivars, such as apples, tomatoes, peaches, chilli peppers, etc.
- ii. **Size of fruit:** Changes in the size of a crop while growing are frequently used to determine the time of harvest. For example, partially mature cobs of *Zea mays saccharate* are marketed as sweet corn, while even less mature and thus smaller cobs are marketed as baby corn. For bananas, the width of individual fingers can be used to determine harvest maturity. Usually, a finger is placed midway along the bunch, and its maximum width is measured with callipers; this is referred to as the calliper grade.
- iii. **Shape of fruit:** The shape of fruit can change during maturation and can be used as a characteristic to determine harvest maturity. For instance, a banana becomes more rounded in cross sections and less angular as it develops on the plant. Mangoes also change shape during maturation. As the mango matures on the tree, the relationship between the shoulders of the fruit and the point at which the stalk is attached may change. The shoulders of immature mangoes slope away from the fruit stalk; however, on more mature mangoes, the shoulders become level with the point of attachment, and with even more maturity, the shoulders may be raised above this point.

- iv. **Aroma:** Most fruits synthesise volatile chemicals as they ripen. Such chemicals give fruit its characteristic odour and can be used to determine whether it is ripe or not. These odours may only be detectable by humans when a fruit is completely ripe, and therefore have limited use in commercial situations.

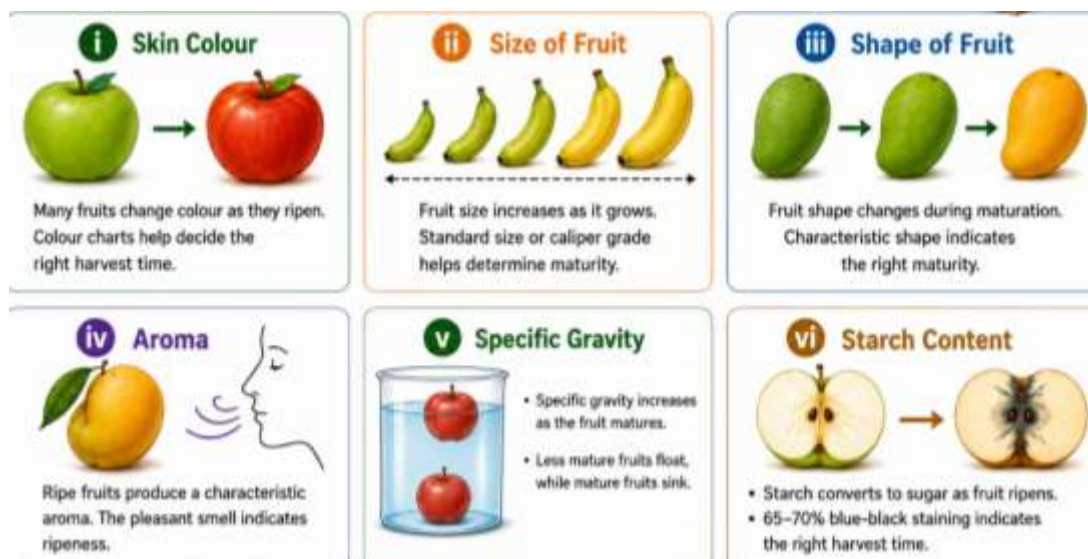


Fig. 1.2: Maturity indices in crops

- v. **Specific gravity:** Specific gravity is the ratio of the density of a substance to the density of pure water at a specified reference temperature (commonly 4°C), making it a dimensionless quantity. Specific gravity is obtained by comparing the weights of equal volumes of other bodies with the weight of water. In practice, the fruit or vegetable is weighed in air, then in pure water. Specific gravity is calculated from the ratio of the weight in air to the loss of weight in water. This provides a reliable measure of fruit maturity. As a fruit matures, its specific gravity increases. This parameter is rarely used in practice to determine the time of harvest, but could be used in cases where the development of a suitable sampling technique is possible. It is used, however, to grade crops according to different maturities at post-harvest. This is done by placing the fruit in a tank of water, wherein those that float are less mature than those that sink.
- vi. **Starch content:** Measurement of starch content is a reliable technique used to determine maturity in pear and apple cultivars. The method involves cutting the fruit in two and dipping the cut pieces into a solution containing 4% potassium iodide and 1% iodine. The cut surfaces stain to a blue-black colour in places where starch is present. Starch converts into sugar as harvest time approaches. Harvest begins when the samples show that 65-70% of the cut surfaces have turned blue-black.

5. Stage of Harvesting

The stage of harvesting refers to the optimal time when crops or produce are collected for maximum quality, yield, and nutritional value. The stage varies depending on the type of crop, its intended use (fresh consumption, processing, storage), and the desired characteristics (size, colour, taste). Here are the main stages of harvesting:

- a) **Pre-harvest stage:** The period just before the harvest, where the crop has matured but hasn't yet reached the point of full ripeness or readiness for harvest. Farmers often monitor the crop closely during this period to assess when to harvest.
- b) **Maturity stage:** Crops are considered mature when they have reached their maximum size, weight, or flavour. The maturity stage varies for different crops. For example:
 - Cereal grains (e.g., wheat, rice): Full kernel development, dry grain.
 - Fruits (e.g., apples, tomatoes): Full colour development and firmness.
 - Vegetables (e.g., carrots, spinach): Maximum size without becoming bitter.
- c) **Physiological ripeness:** This is when the crop has reached its optimal growth, but it may not be at full edible quality. For some crops, like tomatoes or bananas, the physiological ripeness may happen before full colour change or softening, while for others, it is when the crop starts to show signs of readiness.
- d) **Full ripeness:** At this stage, the crop is at its peak quality, flavour, and appearance for fresh consumption. For some crops, like strawberries or peaches, full ripeness is when the fruit is at its sweetest and best-tasting.
- e) **Post-ripeness (over-ripeness):** Beyond full ripeness, the produce may begin to deteriorate in quality. For example, fruits may become too soft, lose flavour, or develop undesirable textures. Some crops are harvested before full ripeness to prevent this, especially for storage or shipping purposes.

6. Time of Harvesting

The time of harvesting refers to the specific period when crops are collected for optimal quality and yield. It is influenced by several factors, including the type of crop, environmental conditions, and intended use. Harvesting too early or too late can lead to poor quality or reduced yield. Below are key factors to consider when determining the time of harvesting:

- i. **Types of Crop:** Different crops require different times for harvesting based on their growth and ripening processes:

- Grains (e.g., wheat, rice): Harvested when grains are fully matured, usually after they reach physiological maturity and the moisture content is low enough for storage.
 - Fruits (e.g., apples, grapes): Many fruits are harvested when they reach full ripeness, which may vary depending on the intended market (fresh or processed). For example, tomatoes are often picked just before full ripeness for shipping purposes.
 - Vegetables (e.g., carrots, spinach): Harvested at their peak size and tenderness, which is often before they start to flower or become overripe. Some vegetables, like beans, are harvested when the pods are mature, but others, like leafy greens, are harvested early for the best texture and flavour.
- ii. **Season and climate:** The time of year and local climate conditions play a significant role in determining the right time for harvesting:
- Temperature: In warm climates, crops may ripen earlier, while cooler conditions may delay maturity.
 - Rainfall: Excessive rain can lead to fungal diseases or reduced quality, while drought may stunt growth. Farmers may need to harvest earlier in times of stress.
 - Frost: For many crops, frost can damage the produce, so harvesting is done before the first frost hits, especially for crops like pumpkins, squash, or certain leafy vegetables.
- iii. **Maturity indicators:** Different crops have specific indicators that tell when they are ready for harvest:
- Cereal grains (e.g., wheat, rice): Harvest when the grain is fully developed and dry, and the plant begins to yellow or dry down.
 - Fruits: Often harvested when they reach full colour, firmness, and flavour. For example, tomatoes change from green to red, and bananas from green to yellow.
 - Vegetables: For leafy vegetables, harvest before the plant becomes too mature, tough, or bitter. For root vegetables like carrots, the time of harvest depends on their size and tenderness.
- iv. **Moisture content:** For many crops, especially grains like wheat and rice, moisture content is a critical factor in deciding the harvest time. Crops are usually harvested when their moisture content has dropped to a level suitable for storage without spoiling. For grains:
- Wheat: Typically harvested when moisture content is around 12-15%.
 - Rice: Harvested when moisture content drops to 18-20%.

- v. **Harvesting window:** It is the optimal time period during which a crop can be harvested to achieve the best quality, yield, and market value, ensuring maximum nutritional and sensory characteristics. Some crops have a small window of time when they are at their best for harvesting. For example, sweet corn is usually harvested at the milk stage, but if left too long, it can become tough and starchy. Overripe crops, especially fruits, may become overly soft, lose flavour, or start to rot, reducing their market value.
- vi. **Market considerations:** Crops like fruits and vegetables for fresh markets are usually harvested just before or at full ripeness to ensure they are tasty and visually appealing. For crops intended for processing (e.g., canning, freezing) or storage (e.g., potatoes), harvesting may occur earlier to ensure they remain firm and retain quality during storage.

7. Harvesting Equipment

Harvesting equipment includes tools, machines, and machinery used to collect crops from the field efficiently and safely. These tools are designed to reduce labour, time, and effort involved in harvesting, while ensuring minimal damage to the crops. Harvesting equipment varies depending on the type of crop being harvested and the scale of farming operations. Here is an overview of common types of harvesting equipment:

- i. **Manual harvesting tools:** They are handheld instruments used for cutting, gathering, and collecting crops. These tools are typically used in small-scale farming, home gardens, or for crops requiring delicate handling to minimise damage. Here is a list of commonly used manual harvesting tools:
 - **Sickles and scythes:** These are traditional hand tools used for cutting grain, grass, or small crops. They are still used in small-scale or labour-intensive farming [Fig. 1.3 (a) and (b)].



Fig. 1.3: (a) Sickle

(b) Scythe

- **Harvesting knives:** Specially designed knives for cutting specific crops like fruits or vegetables (Fig. 1.4). For example, they are used for harvesting tomatoes, lettuce, or grapes.



Fig. 1.4: Various harvesting knives

- **Pruning shears:** These are used for cutting fruits, flowers, and vines. They are often used for small-scale orchards and vineyards (Fig. 1.5).



Fig. 1.5: Pruning Shears

- ii. **Mechanical harvesters:** These machines are used for large-scale farming to harvest various types of crops quickly. Machines for fruit and vegetables are designed to pick fruits and vegetables from plants in the field. For example, potato harvesters dig up potatoes, tomato harvesters gently shake the plants, and apple harvesters use mechanical arms to shake or pick the fruits. Some harvesters are equipped with gentle conveyor belts or vibration systems to avoid damaging delicate produce like tomatoes or strawberries.
- iii. **Tree fruit harvesting equipment:** Tree fruit harvesting equipment includes tools and machines specifically designed to pick, collect, or harvest fruits from trees efficiently and with minimal damage. The choice of equipment depends on factors like the type of fruit, tree height, orchard size, and labour availability. These can be as follows:
 - **Tree Shakers:** These machines are used in orchards for fruits like almonds, olives, apples and walnuts. They shake the tree to drop the fruit to the ground, where it is collected.
 - **Air-assisted Harvesters:** These machines use powerful air jets to gently blow fruit from the branches, making it easier for operators to collect the produce.

- iv. **Specialised harvesters for other crops:** Specialised harvesters are machines designed to efficiently harvest specific crops with unique growth patterns, harvesting requirements, or delicate handling needs. These harvesters improve productivity, reduce crop damage, and save labour compared to traditional methods. Here's an overview of specialised harvesters for various crops:
- **Rice harvesters:** These are designed to handle the delicate nature of rice and typically consist of a combine harvester with specialised features like a floating cutter bar to harvest rice without damaging the crop.
 - **Peanut harvesters:** These machines dig up peanuts and separate them from the soil.

Practical Exercise

Activity 1: Group discussion on the factors influencing the maturity of crops.

Materials Required:

1. Chart paper or whiteboard
2. Markers or pens
3. Notebooks or loose sheets for note-taking
4. Reference materials (textbooks, extension publications, or digital resources)

Procedure:

- Start by understanding what "crop maturity" means.
- Each member of the group should think about one factor and share their thoughts. Use examples of different crops to illustrate how each factor can impact their growth stages.
- After discussing, create a summary of the key points and share it with the class.
- Conclude the discussion by reflecting on how these factors work together to determine the right time for harvesting crops.

Activity 2: Identification of stage of harvesting of different agricultural crops

Material Required:

1. Crop samples/images
2. Notebook
3. Pen

Procedure:

- Observe the crop carefully.
- Note maturity signs like colour change, drying of leaves, and grain hardness.
- Compare with standard harvesting indicators.
- Identify whether the crop is immature, mature, or ready to harvest.
- Record the observations.

Check Your Progress**A. Multiple Choice Questions**

1. What is the main factor determining the time of harvest for a crop?
 - a) Soil type
 - b) Crop maturity
 - c) Pest infestation
 - d) Harvesting equipment
2. Which of the following is a key indicator of crop maturity?
 - a) Colour change in fruits
 - b) Leaf size
 - c) Branch density
 - d) Root structure
3. Ripening in crops is mainly characterised by:
 - a) Increased hardness
 - b) Decreased biochemical activity
 - c) Biochemical changes improving flavour and aroma
 - d) Reduced sugar content
4. What is a reliable technique to determine the maturity of apples and pears?
 - a) Measuring the size of the fruit
 - b) Using specific gravity
 - c) Starch content test with iodine solution
 - d) Visual assessment
5. Which of the following hormones regulates the ripening process in many fruits?
 - a) Auxin
 - b) Ethylene
 - c) Gibberellin
 - d) Cytokinin
6. What is the effect of over-fertilisation with nitrogen on crop maturity?
 - a) Accelerates maturity
 - b) Delays maturity

- c) Increases pest resistance
 - d) Enhances ripening
7. What factor causes grapes to mature faster in warmer regions?
 - a) Reduced soil fertility
 - b) Increased water stress
 - c) Higher temperatures
 - d) Lower sunlight exposure
 8. Which stage of harvesting refers to the crop being at its peak flavour and quality?
 - a) Pre-harvest stage
 - b) Physiological ripeness
 - c) Full ripeness
 - d) Post-ripeness
 9. Specific gravity is used to measure the maturity of which type of produce?
 - a) Leafy vegetables
 - b) Tubers like potatoes
 - c) Fruits like mangoes
 - d) Grains like wheat
 10. What is the importance of using tree shakers in harvesting?
 - a) They minimise pest damage
 - b) They reduce labour costs and time
 - c) They improve fruit ripening
 - d) They increase nutrient content

B. Fill in the Blanks

1. _____ refers to the point when a crop has fully developed and is physiologically ready for harvest.
2. The gas that influences ripening in many fruits is _____.
3. The maturity index involving blue-black staining is based on _____ content.
4. _____ are used to harvest fruits like almonds and walnuts by shaking trees.
5. _____ content in grains like wheat and rice is a key factor for determining the time of harvest

C. State Whether the Following Statements are True or False

1. Ripening and maturity refer to the same process in crop development.
2. Over-fertilisation with nitrogen can delay crop maturity.
3. Specific gravity is commonly used in commercial harvesting decisions.
4. Manual tools like sickles and knives are never used in modern agriculture.
5. High temperatures generally delay the maturity of crops.

D. Subjective Questions

1. A farmer harvested tomatoes before they turned fully red so they could be transported to a distant market. Explain why this harvesting decision may be beneficial.
2. While buying mangoes from a market, you noticed that some fruits had a pleasant aroma and rounded shoulders near the stalk. What do these signs indicate about the maturity of the mangoes?
3. A wheat farmer delayed harvesting even after the grains had matured. What problems can arise due to the late harvesting of crops? Explain with suitable examples.
4. A farmer observed that his crop matured earlier during a hot summer season than during winter. Which factor affecting crop maturity is responsible for this change? Explain how it influences maturity.
5. A fruit grower used pruning shears and tree shakers during harvesting in the orchard. Explain the use of these two harvesting tools and how they help in efficient harvesting.

What have you learned?

After completing this session, you will be able to:

- identify the ideal stage of harvesting for different crops to maximise quality and minimise post-harvest losses;
- evaluate the appropriate time for harvesting by considering factors such as climate conditions and proximity to the market;
- identify suitable harvesting equipment based on crop type, efficiency, and cost-effectiveness.

Session 2: Methods and Techniques of Harvesting

A harvesting method refers to the overall approach used to collect a crop, while harvesting techniques are the specific practices employed to carry out that method efficiently. For example, in a wheat crop, the harvesting method may be mechanical harvesting using a combine harvester, whereas the techniques include adjusting the cutter-bar height, setting the appropriate threshing speed, and minimizing grain losses during collection. Similarly, in a fruit orchard, the harvesting method may be manual harvesting, while the techniques involve hand-picking ripe fruits, gently twisting fruits to prevent damage, and using picking bags or ladders to facilitate safe and efficient harvesting. Thus, the method defines the general system of harvesting, whereas techniques describe the specific actions and procedures used within that system.

In organic farming, harvesting methods focus on maintaining product integrity, minimising environmental impact, and ensuring sustainability. The emphasis is on

manual or minimally mechanised processes to preserve soil health and the organic nature of the produce. These methods vary depending on the type of resource being harvested, the scale of operation, and the tools or technologies used.

1. Methods of Harvesting

Harvesting techniques differ based on the type of crop, ensuring the quality, longevity, and usability of the produce. Some of the harvesting methods for fruits, vegetables, flowers, and grains/seeds are as follows:

A. Fruit picking method: Fruits require careful harvesting to avoid bruising or damage, as they are often delicate and perishable. There are several types of fruit-picking methods, chosen based on the fruit's size, delicacy, and how firmly it is attached to the plant (Fig. 1.6):

a) Hand Picking

- The most common method
- Fruits are gently plucked by hand
- Used for delicate fruits like mangoes, apples, and strawberries
- Minimises damage and bruising



Fig. 1.6: Fruit picking methods

b) Clipping / Cutting

- Fruits are cut using scissors or secateurs
- A small stem is left attached
- Used for grapes, citrus, and some flowers
- Prevents tearing of the fruit or plant

c) Twisting Method

- Fruit is twisted until it separates naturally
- Used for apples, pears, and guava
- Helps avoid damage to branches

d) Shaking Method

- Tree branches are shaken, so the fruits fall
- Used for nuts or hardy fruits like almonds
- Often combined with nets or sheets to catch fruits.

e) Pole Picking

- This method is suitable for fruits growing on tall trees.
- Poles with cutting or catching mechanisms are used to gently collect the fruit.
- Long poles with hooks or cutters are used.
- Useful for tall trees such as coconut and mango.
- Sometimes includes a net to catch fruit.

f) Mechanical harvesting

- In this method, machines shake trees or use automated arms to collect fruits. It is common for nuts, citrus fruits, or olives in large orchards. This method may not be suitable for fragile fruits due to the risk of damage.
- Used in large-scale farming (e.g., oranges, olives)
- Faster but may cause some damage

g) Selective Picking

- Only mature and marketable fruits are harvested
- Done in multiple rounds
- Common for fruits that ripen unevenly (e.g., tomatoes, berries)

Each method is chosen to reduce damage, maintain quality, and improve efficiency depending on the crop.

B. Harvesting of vegetables: Vegetables vary in harvesting requirements depending on their type, size, and fragility (Fig. 1.7).

- a) **Hand harvesting:** It is common for leafy greens (e.g., spinach, lettuce), herbs, and root vegetables (carrots, radishes). It requires careful selection of mature produce while avoiding damage to plants.
- b) **Knife or sickle harvesting:** This method is used for larger vegetables like cabbage, pumpkins or squash. In this method, the stem is cut cleanly without harming the main plant.



Fig. 1.7: Harvesting of vegetables

- c) **Uprooting:** In this method, root crops like potatoes, beets, and onions are pulled from the ground. It may involve hand tools like spades or hoes for small-scale harvesting.

C. Harvesting of flowers: Harvesting flowers requires precision and care to maintain their aesthetic and commercial value.

- a) **Hand picking:** Flowers like roses, tulips, and daisies are carefully cut with pruning shears to avoid stem damage. It is done early in the morning or late evening to preserve freshness.
- b) **Shearing or scissors:** This method is used for flowers with sturdy stems (e.g., sunflowers, chrysanthemums). It requires a clean cut that prolongs vase life.

- c) **Mechanical cutting:** This method is for large-scale flower farming, where machines cut flowers while ensuring uniform stem lengths. It is common for crops like lavender or marigolds.

D. Harvesting of grains and seed crops: Grains and seed crops require efficient methods to minimise losses and ensure clean collection (Fig. 1.8). They are as follows:

- a) **Manual harvesting:** This is a traditional method, using sickles or scythes to cut cereal crops like wheat, rice, or barley. It requires labour-intensive methods and is used in small-scale farming.



Fig. 1.8: Harvesting of grains and seed crops

- b) **Mechanical harvesting:** It requires machines that cut, thresh, and clean grains in a single operation. It is used for wheat, rice, maize, and similar crops. This method is highly efficient for large-scale farming.
- c) **Shaking and winnowing:** In this method, seeds are separated from chaff using manual or mechanical processes. It is used for crops like quinoa, mustard, and sesame.

2. Time of Harvesting

Times of harvesting refer to the specific periods during which fruits or crops are collected to ensure optimal quality, taste, and shelf life. These times vary depending on factors such as the type of crop, climatic conditions, and intended use. For example:

- a) **Early harvesting:** Done to meet market demands or avoid over-ripening. Common for fruits like bananas and avocados that ripen post-harvest.
- b) **Peak harvesting:** Occurs when fruits or crops are fully ripe, ensuring maximum flavour and nutritional value. Ideal for delicate fruits like berries and grapes.
- c) **Late harvesting:** Sometimes practised for specific purposes, such as increasing sugar content in grapes for wine production or allowing nuts to fall naturally.

Ideal harvesting time depends on several factors, including the economic value of the crop, intended use, and storage requirements. In some cases, fruit needs to be tested for parameters such as sugar content, acidity and many more.

3. Precautions to be taken during harvesting

The following are the precautions that help maintain the quality, safety, and market value of the produce.

- a) **Timing:** Harvest at the right time to ensure the best quality and shelf life of the produce. Avoid harvesting during wet or excessively hot conditions to prevent spoilage.
- b) **Tools and equipment:** Use clean and well-maintained tools such as knives, shears, or poles to minimise damage to the fruits and plants.
- c) **Handling:** Handle produce gently to avoid bruising or crushing, especially for delicate fruits like berries, grapes, and tomatoes.
- d) **Hygiene:** Ensure workers practice good hygiene by wearing gloves and clean clothing to prevent contamination of produce.
- e) **Storage:** Place harvested crops in shaded, cool areas immediately to prevent heat damage. Use appropriate containers to avoid stacking that can crush or bruise fruits.
- f) **Transportation:** Use proper packaging and vehicles to transport harvested produce to minimise damage during transit.
- g) **Maturity level:** Harvest only fully mature crops or fruits to ensure the best taste and quality. Immature or overripe produce should be avoided.
- h) **Crop-specific care:** Follow specific guidelines for each type of crop. For example, avoid shaking trees excessively for fragile fruits and use proper cutting tools for crops such as mango and coconut.

4. Disposal of Waste

Proper disposal of waste generated during harvesting and post-harvest processes is essential to maintain hygiene, prevent environmental pollution, and promote sustainable agricultural practices.

Below are methods for effective waste disposal:

- a) **Composting:** Organic waste, such as leaves, fruit peels, and damaged crops, can be composted to create nutrient-rich manure for soil enrichment.
- b) **Animal Feed:** Edible agricultural waste can be reused as feed for livestock, reducing waste and supporting animal husbandry.
- c) **Recycling:** Materials like packaging, plastic containers, and metal tools should be recycled wherever possible to minimise landfill use.
- d) **Mulching:** Non-edible plant residues, such as stems and branches, can be chopped and used as mulch to retain soil moisture and improve fertility.
- e) **Biogas production:** Organic waste can be converted into biogas, providing a renewable source of energy and reducing methane emissions.
- f) **Landfill disposal:** Non-recyclable and non-biodegradable waste should be carefully transported to designated landfill sites to prevent littering and contamination.
- g) **Burning (controlled):** In some cases, controlled burning of agricultural residues may be necessary but should be done following environmental regulations to minimise air pollution.
- h) **Waste segregation:** Separate waste at the source into biodegradable, recyclable, and hazardous categories for proper disposal or treatment.

Practical Exercise

Activity 1: Demonstration of the use of harvesting tools and equipment.

Materials Required:

- Harvesting tools (sickle, scythe, pruning shears)
- Protective gloves
- Plants or safe materials for practice
- Cleaning cloth
- Whiteboard

- Markers

Procedure:

- Observe the harvesting tools listed above and identify those most commonly used in the local area or for the specific crop.
- Practice using each tool in a safe, open space. If available, test tools like the sickle, scythe, or pruning shears on actual plants or use safe materials to simulate cutting. Focus on proper motion, control, and safe handling.
- Protective gloves should be worn when handling sharp tools. Tools must be used carefully—always cutting away from the body and maintaining a steady grip to prevent injury.
- After use, tools should be cleaned and stored properly. Wipe off dirt with a damp cloth, and sharpen blades as needed to ensure functionality.

Activity 2: Group discussion on harvesting precautions, timing, and waste disposal.

Materials Required:

- Whiteboard, markers
- Paper
- Pens
- Reference materials on crops
- Waste management techniques.

Procedure:

- Divide into small groups (4-5 students).
- Discuss necessary precautions during harvesting for different crops, focusing on safety and best practices.
- Explore the ideal harvesting time for various crops, considering local examples.
- Discuss ways to manage harvesting waste, such as composting, mulching, or using it for livestock.
- Summarise the discussion and highlight key points on paper or whiteboard.
- Share group findings with the class, reflecting on how these practices can be applied to local farms or communities.

Check Your Progress

A. Multiple Choice Questions

1. Which harvesting method is most effective for minimising damage to delicate fruits like berries or grapes?

- a) Mechanical harvesting
 - b) Manual picking
 - c) Shaking and winnowing
 - d) Shearing
2. How can organic farmers ensure minimal environmental impact while harvesting fruits like mangoes or coconuts?
- a) Use automated arms to pick fruits
 - b) Shake the trees vigorously
 - c) Utilise climbing and pole harvesting techniques
 - d) Harvest all fruits regardless of maturity
3. When harvesting leafy vegetables like spinach and lettuce, what is the most suitable method?
- a) Uprooting
 - b) Hand harvesting
 - c) Knife or sickle harvesting
 - d) Mechanical cutting
4. What is the primary benefit of composting organic waste generated during harvesting?
- a) Reduces transportation costs
 - b) Creates nutrient-rich manure for soil
 - c) Prevents pests from damaging crops
 - d) Increases storage life of harvested crops
5. In flower harvesting, what method ensures the longest vase life for flowers like sunflowers and chrysanthemums?
- a) Hand picking early in the morning
 - b) Mechanical cutting with long stems
 - c) Shearing or using scissors for clean cuts
 - d) Uprooting the flowers carefully

B. Fill in the Blanks

1. Fruits like apples, berries, and grapes are often harvested using the _____ method to avoid bruising or damage.
2. _____ harvesting involves machines that cut, thresh, and clean grains in a single operation, increasing efficiency for large-scale farming.
3. To retain soil moisture and improve fertility, non-edible plant residues can be used as _____.
4. _____ harvesting is done early to meet market demands or prevent over-ripening, especially for fruits like bananas and avocados.
5. Organic agricultural waste can be converted into _____, which provides renewable energy and reduces methane emissions.

C. State Whether the Following Statements are True or False.

1. Hand harvesting is commonly used for leafy greens, herbs, and root vegetables like carrots and radishes.
2. Mechanical harvesting is the preferred method for delicate fruits such as berries and grapes.
3. Flowers are best harvested during wet or excessively hot conditions to maintain freshness.
4. Composting is an effective way to convert organic agricultural waste into nutrient-rich manure.
5. Controlled burning of agricultural residues can be done without any consideration for environmental regulations.

D. Subjective Questions

1. A farmer harvesting strawberries for a nearby market used hand-picking instead of mechanical harvesting. Explain why hand-picking is more suitable for delicate fruits.
2. A grape grower used scissors to harvest grape bunches while leaving a small stem attached. How does this harvesting method help maintain the quality of the fruits?
3. A vegetable farmer used uprooting to harvest onions and potatoes. Explain why this method is suitable for root crops and mention the tools that may be used.
4. A large-scale wheat farmer preferred mechanical harvesting over manual harvesting. State two advantages of mechanical harvesting in grain crops.
5. After harvesting tomatoes, a farmer immediately placed them in a shaded area and transported them in proper containers. Why are these precautions important during harvesting and transportation?

What have you learned?

After completing this session, you will be able to:

- define appropriate harvesting techniques suited to different crop types (e.g., fruits, vegetables, grains);
- differentiate harvesting methods based on the scale of farming, including small-scale, medium-scale, and large-scale operations;
- explain efficient harvesting tools and equipment based on the specific crop and farm size; and
- identify crop damage and post-harvest losses by applying proper harvesting techniques.

Session 3: Post-Harvest Handling and Management Practices

Post-harvest activities play a crucial role in maintaining the quality, shelf life, and marketability of the harvested produce. These activities help ensure that crops are properly prepared for distribution and consumption. Post-harvest practices are designed to ensure that organic produce is handled with care, remains free from contamination, and is stored and transported under optimal conditions. By following strict grading, cleaning, packaging, and quality control procedures, organic growers can maintain the integrity of their products, maximise their market appeal, and meet both consumer and regulatory expectations.

1. Post-harvesting Activities

Each activity during the post harvest helps preserve the freshness and quality of the produce while adhering to organic principles. Below is a breakdown of the key post-harvest activities in organic growing:

- a) **Grading:** It involves sorting the produce based on size, shape, colour, and quality. This ensures uniformity and meets market standards. It helps in separating high-quality fruits from damaged or lower-quality ones, improving both price and presentation.
- b) **Trimming:** Removal of unwanted parts such as stems, leaves, or any damaged portions of the produce is known as trimming. It enhances the appearance and extends the shelf life by preventing decay in damaged areas.
- c) **Packing/Packaging:** Packing is the process of placing the graded produce into appropriate containers to protect them during transportation and storage. Packaging materials like cartons, crates, or plastic containers are chosen based on the type of produce. Proper packing ensures the produce is not damaged.
- d) **Labelling:** Proper labelling is essential for tracking and marketing purposes. Labels typically include information such as the name of the produce, weight, origin, harvest date, expiration date, and storage instructions. Clear and informative labels help in compliance with food safety standards.
- e) **Cleaning:** Cleaning removes dirt, dust, microorganisms, and permitted residues. It can be done using water, brushes, or specific cleaning agents that are safe for food products. Clean produce not only looks better but is also safer for consumption.
- f) **Drying:** It is the process of reducing the moisture content of the produce to prevent microbial growth and spoilage. This can be done through natural drying (e.g., sun-drying) or mechanical drying (e.g., using dryers). Drying is commonly used for fruits like raisins, apples, or herbs.

- g) **Pre-storage treatment:** It includes processes such as curing, approved organic coatings, or other permitted organic post-harvest treatments. For example, some fruits may receive approved food-grade edible coatings permitted under organic standards to prevent moisture loss, while certain vegetables might be treated to avoid mould growth.
- h) **Quality control:** It ensures that all harvested produce meets the required standards. It involves monitoring each post-harvest activity to ensure the produce is of high quality. It may include checking for defects, ensuring proper storage conditions, and adhering to food safety regulations. Testing for prohibited pesticide residues, and other contaminants is also an essential part of this process.

2. Grading of Crop based on Size, Colour and Quality

Grading is the process of categorising agricultural produce into different groups or grades based on certain attributes such as size, colour, and quality. This ensures uniformity, enhances market value, and meets consumer expectations. The following are explained below:

- a) **Grading based on size:** Crops are sorted into categories based on their dimensions (e.g., length, width, or weight). For examples:
- **Fruits:** Apples, oranges, and mangoes are graded as small, medium, or large.
 - **Vegetables:** Potatoes and onions are classified by diameter or weight.

Equipment like sieves, size graders, or sorting machines are often used for precision.

- b) **Grading based on colour:** Crops are graded according to their colour, which reflects maturity, ripeness, or aesthetic appeal. For examples:
- **Tomatoes:** Sorted as green (immature), partially red (ripening), or fully red (ripe).
 - **Tea leaves:** Graded based on the uniformity and depth of green.
 - **Fruits:** Bananas and grapes are categorised by colour to indicate ripeness.

Colour grading can be done manually or using automated systems with sensors.

- c) **Grading based on quality:** Quality grading involves evaluating the overall condition, ripeness, and absence of defects or blemishes. For examples:
- **Fruits and Vegetables:** High-grade produce is fresh, unblemished, and free from pests or diseases. Lower grades may have slight imperfections.
 - **Grains and Pulses:** Assessed based on cleanliness, uniformity, and moisture content.

- **Tea and Coffee:** Evaluated for aroma, flavour, and texture.

Quality assessment may also include sensory evaluation and laboratory tests for parameters like sugar content (Brix), acidity, or testing for prohibited pesticide residues where applicable..

3. Packaging

It plays an important role in the fruit and vegetable distribution chain. There are as many types of packages available as there are products to put in them. Packaging is critical for protecting produce quality. Organic product packaging should have minimal adverse environmental impacts, and processors of organic food should avoid unnecessary packaging materials. Organic food should be packaged in reusable, recycled, recyclable and biodegradable packaging whenever possible. The packaging material and method should be selected based on the type of crop, its shelf life, and market requirements.

Packaging materials for crops are essential in protecting them during storage, transportation, and distribution while also ensuring their quality and extending shelf life. The materials used for crop packaging vary depending on the type of crop, environmental factors, and market demands. Some common materials for crop packaging are listed in Table 1.1.

Table 1.1: Materials used for packaging

S.No.	Material Used	Example
1.	Wood	Wooden boxes- mangoes, apples, and citrus. Bamboo basket - leafy vegetables like spinach or herbs.
2.	Jute	Rice, wheat, and pulses
3.	Cotton bags	Dry fruits, spices, and small produce items
4.	Glass	Juices, pickles, and sauces
5.	Paper and Board	Paperboard packaging for breakfast cereals, lightweight and recyclable
6.	Moulded-Pulp Packs	Biodegradable moulded pulp works to protect eggs during transport
7	Flexible Paper Packs	Paper packs for chilli powder, turmeric, and dry fruits
8.	Carton Board Pack	Carton board packaging for fruit juices, shelf-stable

9.	Folding Boxboard	Folding boxboard used for packaging biscuits, sturdy and protective
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4. Ideal Storage Condition

To maximise storage life and maintain the quality of harvested organic products, proper storage conditions are essential. Fresh fruits and vegetables require low temperatures (0 to 13°C (32–55°F)) and high relative humidity (80 to 95%) to reduce respiration, slow metabolic processes, and minimise transpiration rates.

It must be protected at all times from contact with materials and substances not permitted for use in organic farming and handling. Bulk stores for products should be separate from conventional product stores and clearly labelled to that effect.

Storage areas and containers used for organic products must be cleaned using methods and materials approved under organic production standards. Measures should be taken to prevent possible contamination from any pesticide or other treatment.

5. Equipment and Machinery for Post-Harvest Activities

Equipment and machinery used in the post-harvest handling of produce vary widely according to the specific crop, its intended use, the nature of any particular enterprise and the point that produce has reached within the post-harvest handling system. The equipment and machinery used during Post-harvest processing help in cleaning, sorting, packing, storing, and preserving crops. Below are some key types of equipment and machinery used in Post-harvest activities (Fig. 1.9):

6. Methods for Recycling

Post-harvest activities generate significant amounts of waste, including organic waste (such as plant residues, peels, and damaged fruits), packaging waste (plastics, cartons, and other materials), and waste from cleaning, sorting, and processing. Managing this waste through recycling, composting, or proper disposal is essential to minimising environmental impact and promoting sustainability. Below are methods for recycling or disposal of waste created during Post-harvest activities:

- **Composting of organic waste:** Organic waste from Post-harvest activities, such as fruit and vegetable scraps, plant residues, and peels, can be composted. Composting is a natural process where microorganisms break down organic matter into humus (compost) that can be used as a soil amendment. This process reduces waste volume, improves soil fertility, and helps sequester carbon.

Method: Organic waste is collected, chopped into smaller pieces, and mixed with carbon-rich materials (such as straw or leaves) to promote microbial

decomposition. The compost should be turned regularly to aerate and speed up the process.



Fig. 1.9: Equipment and machinery for post-harvest activities

- **Biogas production:** Organic waste, including crop residues, peels, and by-products, can be used to produce biogas through anaerobic digestion. In this process, microorganisms break down organic matter in the absence of oxygen, producing biogas (mainly methane) that can be used as a renewable energy source.

Method: Waste is collected and fed into anaerobic digesters, which are sealed containers that create a low-oxygen environment for the microorganisms to break down the material. The biogas produced can be used for heating or generating electricity.

- **Animal feed production:** Some of the organic waste from Post-harvest activities, such as stems, leaves, or damaged fruits, can be repurposed as animal feed for livestock, poultry, or fish.

Method: Inedible crop parts are collected, cleaned, and processed (e.g., chopped or dried) into animal feed. Certain crops, such as corn stalks, potato peels, and vegetable tops, can be suitable for animal consumption.

- **Recycling packaging materials:** Packaging waste from Post-harvest activities, such as plastic films, shrink-wrap, and containers, can be recycled. However, this requires separating recyclable plastics from non-recyclable materials and cleaning them to remove any residue.

Method: Collected plastics are sorted, cleaned, and processed into pellets that can be reused in the manufacturing of new plastic products. This process helps reduce the consumption of new raw materials and lowers the carbon footprint of packaging.

- **Waste-to-Energy (WTE):** Organic waste that cannot be composted or used for biogas production can be incinerated in waste-to-energy plants. In this process, waste is burned to generate heat and electricity.

Method: Waste is fed into a combustion chamber where it is burned at high temperatures, producing heat and electricity. The heat is used to generate steam, which powers turbines to produce electricity.

Practical Exercise

Activity 1: Group discussion on the post-harvest activities.

Materials Required:

1. Notebooks
2. Pens
3. Charts
4. Markers
5. Camera
6. Reference materials

Procedure:

- Form small groups of 4–5 students to discuss key points and how post-harvest activities apply to different crops.
- Record the observations in tabular form. Discuss possible challenges and solutions.
- Each group creates a summary using a list, diagram, or flowchart to show key post-harvest steps and strategies.
- After presentations, reflect on the role of post-harvest practices in improving food security, reducing waste, and boosting farm profitability.

Activity 2: Visit to a warehouse/ processing unit for understanding the various procedures adopted for grading, packaging and storage of agricultural produce.

Materials Required:

1. Notebooks,
2. Pens
3. Charts
4. Markers
5. Camera
6. Reference materials

Procedure:

- Observe how produce is sorted based on size, quality, and ripeness.
- Study the different packaging methods used to protect the produce during storage and transport.
- Learn about the various storage techniques employed to maintain freshness and prevent spoilage.

Check Your Progress

A. Multiple Choice Questions

1. What is the primary purpose of grading in post-harvest activities?
 - a) To speed up drying processes
 - b) To sort produce based on size, colour, and quality
 - c) To increase the moisture content of produce
 - d) To enhance packaging efficiency
2. Why is trimming an important step in post-harvest processing?
 - a) It increases the weight of the produce for higher pricing
 - b) It removes unwanted parts, enhancing appearance and shelf life
 - c) It adds nutrients to the harvested produce
 - d) It helps separate edible and inedible portions
3. Which packaging material is most commonly recommended for organic produce due to its eco-friendly nature?
 - a) Plastic bags
 - b) Cardboard and paper packaging
 - c) Metal containers
 - d) Synthetic fibre nets

4. What is the key benefit of drying produce during post-harvest handling?
 - a) To improve colour and taste
 - b) To prevent microbial growth and spoilage
 - c) To increase the water content in crops
 - d) To reduce transportation costs
5. Which tool is used to check the Total Soluble Solids (TSS) content in fruits?
 - a) Autoclave
 - b) Thermometer
 - c) Refractometer
 - d) Vacuum sealer
6. How does biogas production contribute to waste management in post-harvest activities?
 - a) By reducing oxygen levels in storage
 - b) By converting organic waste into renewable energy
 - c) By sterilising harvested produce
 - d) By increasing the shelf life of organic waste
7. What is a crucial factor for storing fresh fruits and vegetables to maintain quality?
 - a) Low temperatures and high relative humidity
 - b) High temperatures and low humidity
 - c) Constant sunlight exposure
 - d) Frequent stirring of storage containers
8. Why is composting considered a sustainable method of recycling organic waste?
 - a) It generates renewable energy
 - b) It converts organic matter into nutrient-rich manure
 - c) It uses harmful chemicals for decomposition
 - d) It requires advanced machinery for implementation
9. Which method is commonly used for packaging under vacuum conditions?
 - a) Refrigeration
 - b) Drying equipment
 - c) Vacuum packaging machine
 - d) Peeling equipment
10. What is the role of quality control in post-harvest management?
 - a) Enhancing the size of the produce
 - b) Ensuring compliance with food safety standards and reducing defects
 - c) Speeding up the packaging process
 - d) Increasing the moisture content of the produce

B. Fill in the Blanks

1. Grading involves sorting the produce based on ____, ____, colour, and quality.
2. The removal of unwanted parts like stems, leaves, or damaged portions is known as ____.
3. Composting is the process where microorganisms break down organic waste into ____ that can enrich the soil.
4. A ____ machine is used to pack food materials under vacuum conditions to extend shelf life.
5. The proper packaging of produce ensures it is not ____ or damaged during transportation.

C. State Whether the Following Statements are True or False.

1. Grading based on colour helps to assess the maturity and ripeness of fruits like tomatoes and grapes.
2. Pre-storage treatment always includes waxing and fumigation for every type of harvested crop.
3. Biogas is produced by anaerobic digestion, which involves the breakdown of organic waste in the absence of oxygen.
4. Wooden boxes are commonly used for packaging soft, delicate items like fruit juices and pickles.
5. Composting reduces the volume of organic waste and enhances soil fertility.

D. Subjective Questions

1. A fruit seller separated apples into small, medium, and large categories before packing them for sale. Explain how grading based on size helps in marketing and consumer satisfaction.
2. A farmer packed tomatoes in strong crates instead of overfilling sacks during transportation. How does proper packaging help in reducing post-harvest losses?
3. A food processing unit dries herbs before storage and packaging. Why is drying considered an important post-harvest activity?
4. A warehouse storing organic fruits was kept cool, clean, and separate from conventional products. Explain why ideal storage conditions are necessary for maintaining organic produce quality.
5. A farmer collected fruit peels and vegetable waste after processing and used them to prepare compost. Explain how composting helps in sustainable waste management after harvest.

What have you learned?

After completing this session, you will be able to:

- identify key post-harvest steps like grading, trimming, drying, and pre-storage treatment;

- explain grading based on size, colour, maturity, and quality;
- demonstrate trimming and drying for storage or sale; and
- describe treatments that reduce spoilage and extend shelf life.

Session 4: Innovative Storage Practices for Organic Produce

Storing organic produce effectively is essential to maintain its freshness, quality, and nutritional value. Organic produce may be more susceptible to post-harvest deterioration because synthetic preservatives are not used.

The methods of storing organic produce vary depending on the type of produce and its shelf life. The key to successful storage is maintaining the right temperature, humidity, and airflow to prevent spoilage and preserve nutrients. Additionally, each method, whether refrigeration, freezing, canning, or drying, has its own benefits, and the best method will depend on the available resources, storage space, and the intended use of the produce.

1. Organic Produce

It is grown and harvested following sustainable agricultural practices without the use of synthetic pesticides, fertilisers, or genetically modified organisms (GMOs). The types, composition, and typical volumes of organic produce vary widely depending on regional agricultural conditions, market demand, and seasonal availability.

2. Types of Organic Produce

Organic produce is categorised based on the type of crop and its intended use. These categories include fruits, vegetables, grains, legumes, herbs and spices, nuts and seeds, and other specialty crops. A detailed breakdown is given below:

- a) **Organic fruits:** Fruits grown organically without synthetic pesticides or fertilisers, often prized for their rich flavours and nutritional benefits. These are:
 - Tropical Fruits: Bananas, mangoes, papayas, pineapples, coconuts.
 - Citrus Fruits: Oranges, lemons, limes, grapefruits.
 - Berries: Strawberries, blueberries, raspberries, blackberries.
 - Stone Fruits: Peaches, plums, cherries, apricots.
 - Other Fruits: Apples, pears, grapes, watermelons, cantaloupes.
- b) **Organic vegetables:** Cultivated with natural fertilisers (e.g., compost) and free from synthetic chemicals. These are:
 - Leafy Greens: Spinach, lettuce, kale, arugula, Swiss chard.
 - Cruciferous Vegetables: Broccoli, cauliflower, cabbage, Brussels sprouts.

- Root Vegetables: Carrots, beets, radishes, turnips.
 - Tubers: Potatoes, sweet potatoes, yams.
 - Other Vegetables: Tomatoes, cucumbers, zucchini, eggplants, peppers.
- c) **Organic herbs and spices:** Grown for culinary, medicinal, and aromatic purposes. These are:
- Fresh herbs: Basil, cilantro, parsley, thyme, mint, rosemary.
 - Spices: Turmeric, ginger, cinnamon, cloves, cardamom.
- d) **Organic nuts and seeds:** High-value crops valued for their nutritional content and versatile uses. These are:
- Nuts: Almonds, walnuts, cashews, hazelnuts, pistachios.
 - Seeds: Sunflower seeds, chia seeds, flaxseeds, sesame seeds, pumpkin seeds.
- e) **Organic specialty crops:** Organic specialty crops are high-value crops that are cultivated under organic farming standards for specific markets. These crops are often used in culinary, medicinal, aromatic, and industrial applications. These are:
- Coffee and Tea: Grown in shaded, pesticide-free environments.
 - Cocoa: Used for organic chocolate production.
 - Sugarcane: For organic sugar and molasses.
 - Flowers and Medicinal Plants: Lavender, chamomile, aloe vera.
- f) **Organic grains and cereals:** Staple crops grown without synthetic herbicides or genetically modified seeds. These are wheat, rice, corn (maize), barley, oats, quinoa, millet, sorghum.

3. Composition of Organic Produce

The composition of organic produce encompasses its nutritional, chemical, and physical characteristics. Organic fruits, vegetables, and other crops are cultivated using natural farming practices that emphasize soil health, biodiversity, and ecological balance. These practices can influence the nutritional quality and overall composition of the produce, often resulting in enhanced levels of beneficial compounds and reduced exposure to synthetic chemicals. The key components of organic produce include:

a) Higher Antioxidant Content: Organic produce often contains elevated levels of antioxidants, including polyphenols, flavonoids, and vitamin C. Some studies have reported that antioxidant concentrations that may be 20–40% higher than those found in conventionally grown produce. These compounds help protect the body against oxidative stress and may contribute to reduced risk of chronic diseases.

b) Lower Pesticide Residues: One of the distinguishing features of organic produce is the minimal use of synthetic pesticides. As a result, organic crops generally contain significantly lower pesticide residues and, in many cases, are free from detectable levels of synthetic pesticide contamination, enhancing food safety and consumer confidence.

c) Improved Mineral Balance: Organic farming practices such as compost application, crop rotation, and the use of organic fertiliser improve soil fertility and microbial activity. Consequently, organic produce may contain higher concentrations of essential minerals, including magnesium, potassium, iron, and zinc, contributing to a more balanced nutritional profile.

d) Reduced Synthetic Additives and Contaminants: Organic production standards restrict the use of synthetic growth regulators, genetically modified organisms (GMOs), and certain chemical additives. This helps maintain the natural composition of the produce and reduces the presence of potentially harmful contaminants.

e) Enhanced Soil-Derived Nutritional Quality: Healthy, biologically active soils support better nutrient uptake by plants. The emphasis on soil conservation and organic matter enrichment in organic farming can positively influence the overall quality, flavour, and nutritional characteristics of the harvested produce.

4. Storage Methods of Crops

The storage methods for organic produce are tailored to preserve the quality, freshness, and nutritional value of the crops, while also adhering to organic standards that avoid synthetic chemicals. The appropriate storage method depends on the type of organic crop, its final destination (e.g., fresh market, processing, export), and the customer or market requirements (e.g., shelf life, appearance, flavour). Below are the key storage methods on the basis of crop variety for various types of organic produce:

- a) **Organic fruits:** Most organic fruits like berries (strawberries, raspberries, blueberries), apples, and grapes should be stored at temperatures around 0°C to 4°C (32°F to 40°F) to slow down ripening, prevent spoilage, and extend shelf life. Citrus fruits (e.g., oranges, lemons) require refrigeration at about 5°C to 10°C (41°F to 50°F) to maintain freshness. Organic apples and pears often require Controlled Atmosphere (CA) storage during transport to export markets to maintain quality for longer durations. This method lowers oxygen levels and increases carbon dioxide and humidity to slow down ripening.
- b) **Organic vegetables:** Leafy greens (e.g., spinach, lettuce, kale) and cucumbers should be stored at 0°C to 4°C with high humidity to prevent wilting and dehydration. Tomatoes and peppers are best stored at slightly higher temperatures (around 10°C to 12°C (50°F to 54°F) to prevent chilling injury while maintaining freshness. Root vegetables like organic carrots, beets, potatoes, and radishes need to be stored in cool, dry conditions with good

ventilation. Ideal temperatures range from 4°C to 10°C (39°F to 50°F), and humidity should be moderate to prevent drying out.

Organic potatoes, sweet potatoes, onions, and garlic should be stored in dark, cool, and well-ventilated spaces at temperatures between 7°C and 12°C (45°F to 55°F). High humidity should be avoided to prevent mould growth, especially for onions and garlic. Organic onions and sweet potatoes are often cured in a warm, dry environment (around 26°C to 29°C (80°F to 85°F) for about 1-2 weeks to harden their skins before storage.

- c) **Organic grains (wheat, rice, barley, quinoa):** Organic grains like wheat, rice, barley, and quinoa should be stored in airtight containers or sealed bags in a cool, dry place with low humidity (around 10°C to 15°C (50°F to 59°F) to prevent mould growth and insect infestations. For larger quantities, bulk silos or grain bins with ventilation systems are used to ensure airflow and prevent moisture buildup.
- d) **Organic herbs (basil, mint, parsley, cilantro):** Soft herbs like basil, mint, and cilantro should be stored in the refrigerator in plastic bags or containers with a damp paper towel to maintain humidity and prevent wilting. Organic hard herbs like thyme, rosemary, and oregano can be dried by hanging them in a cool, dry, and well-ventilated area. Once dried, store them in airtight containers in a cool, dark place.

5. Storage and Utilisation of Organic By-Products

Organic farming generates various by-products such as crop residues, animal manure, food processing waste, and compostable material. Proper storage and utilisation of these by-products are essential to maintain environmental sustainability, comply with regulations, and enhance farm productivity. Below is a detailed plan:

- a) **Storage plans:** Effective storage of organic by-products ensures their safe handling, reduces environmental risks, and preserves their nutrient content for later use. Proper storage is critical to prevent nutrient loss, contamination, and environmental harm. Below is a detailed plan for storing various organic by-products in compliance with legislation and codes of practice:
 - i. **Crop residues:** Use designated dry storage areas or silos to prevent decay. Also, Bale and stack residues for compact storage. Follow local regulations to avoid open burning, which is often prohibited due to air pollution laws.
 - ii. **Animal manure:** Use manure pits or covered lagoons to prevent nutrient leaching and odour. Store in lined areas to prevent groundwater contamination. Follow guidelines for manure management under environmental and agricultural regulations (e.g., nitrates directive).

- iii. **Food processing waste:** Store in sealed, biodegradable bags or covered containers. Keep in cool, shaded areas to prevent decomposition before reuse. Adhere to hygiene and waste management standards.
 - iv. **Compostable material:** Create compost piles or bins with proper aeration and moisture control. Use temperature-monitoring practices to ensure pathogen destruction. Also, follow organic certification standards for compost use.
- b) **Utilisation plans:** Proper utilisation of organic by-products helps to improve soil fertility, reduce waste, and contribute to environmental sustainability. Below is a detailed plan to effectively utilise various types of organic by-products in accordance with legislation and codes of practice.
- i. **Composting:** Convert crop residues, food waste, and animal manure into compost. Comply with compost quality standards to prevent heavy metal or pathogen contamination.
 - ii. **Vermicomposting:** Use earthworms to decompose organic materials and produce nutrient-rich vermicompost while adhering to pest and hygiene management standards in organic farming.
 - iii. **Biogas production:** Process manure and food waste in anaerobic digesters to produce biogas and organic slurry. Meet renewable energy and waste recycling standards.
 - iv. **Direct application:** Apply raw or semi-processed manure, crop residues, or green waste to fields as mulch or natural fertilisers. Avoid over-application to prevent nutrient runoff and comply with soil management regulations.

6. Compliance with legislation and codes of practice: Compliance with relevant legislation and codes of practice is essential for the sustainable management of organic by-products. Proper adherence helps prevent environmental harm, supports organic certification, and ensures safe use of resources in agriculture. Ensure all by-product utilisation methods comply with:

- Environmental Regulations: Prevent water, air, and soil pollution.
- Organic Farming Standards: Follow guidelines for fertiliser, compost, and input use (e.g., USDA Organic, EU Organic Regulation).
- Animal feed rules: Ensure food waste used for livestock meets quality.

7. Monitoring and record-keeping: Effective monitoring and record-keeping are crucial for ensuring compliance with organic standards, environmental regulations, and operational efficiency in managing organic by-products. It helps track the use, storage, and disposal of organic materials, supports traceability,

and ensures that all processes meet legislative requirements. It includes maintaining the records of:

- By-product volumes utilised
- Application methods and rates
- Environmental monitoring results (e.g., soil and water quality)

8. Transportation Activities

Transportation is a critical part of the Post-harvest handling process, ensuring that organic produce and by-products are safely delivered from farms to storage facilities, processing plants, or markets. Effective transportation activities help maintain the quality of organic products, ensure compliance with safety and environmental standards, and optimise logistics. A detailed overview of transportation activities related to organic produce is given below:

- a) Compliance with organic standards:** Organic produce must be transported in a manner that prevents any cross-contamination with non-organic products. This includes using dedicated vehicles, packaging, and handling procedures for organic goods. Transport vehicles must be thoroughly cleaned before transporting organic produce to prevent contamination from previous loads, especially if those loads were non-organic.
- b) Environmental conditions:** For perishable organic produce (e.g., fruits, vegetables), maintaining the correct temperature during transportation is crucial to prevent spoilage. Use refrigerated trucks or cool storage units where necessary. However, Transport in refrigerated or insulated trucks to maintain temperature control. Ensure proper ventilation to prevent the build-up of excess moisture, which can lead to mould or spoilage. This is particularly important for organic produce like leafy vegetables, herbs, and mushrooms.
- c) Packaging:** Use organic-approved materials for packaging to ensure compliance with certification standards. Materials such as cardboard, biodegradable plastics, and paper are commonly used. Organic produce should be packed securely to prevent physical damage during transport. Ensure proper stacking to avoid crushing delicate items like fruits or vegetables.
- d) Traceability:** Organic products must be clearly labelled with certification information, origin details, and traceability documentation to confirm that they meet organic standards. Keep records of transport routes, dates, and the responsible parties for traceability purposes.

Practical Exercise

Activity 1: Preparation of charts of storage needs (temperature, humidity) for different organic produce.

Materials Required:

1. Large chart paper or poster board
2. Markers
3. Coloured pencils or crayons
4. Ruler
5. Pictures or diagrams of various organic produce

Procedure:

- Research and gather data on the ideal storage conditions (temperature, humidity, etc.) for different organic produce (fruits, vegetables, herbs).
- Select and organise the produce to be included in the chart.
- Draw a clear table or chart on large chart paper or poster board.
- Label the columns for each produce item and the rows for their storage conditions (temperature, humidity, storage duration, etc.).
- Fill in the data based on the research.
- Use markers, coloured pencils, or crayons to make the chart visually appealing and easy to read.
- Include pictures or diagrams of the product to enhance the presentation.
- Review the chart for accuracy and completeness.
- Display or share the chart for educational or reference purposes.

Activity 2: Identification of storage conditions for organic crops

Material Required:

1. Charts of images of crops
2. Notebook
3. Pen

Procedure:

- Select different organic crops.
- Note their storage requirements (temperature, humidity, ventilation).
- Match each crop with suitable storage conditions.
- Record observations.

Check Your Progress

A. Multiple Choice Questions

1. Why is maintaining the right temperature, humidity, and airflow essential for storing organic produce?
 - a) To ensure compliance with organic standards
 - b) To prevent spoilage and preserve nutrients
 - c) To enhance marketability
 - d) To reduce energy consumption
2. What type of storage method is most suitable for tropical fruits like mangoes and bananas to maintain their freshness?
 - a) Freezing
 - b) Refrigeration at 0°C to 4°C
 - c) Refrigeration at 10°C to 12°C
 - d) Controlled Atmosphere (CA) storage
3. How should organic leafy greens like spinach and kale be stored to prevent wilting?
 - a) At 5°C to 10°C with moderate humidity
 - b) At 0°C to 4°C with high humidity
 - c) At room temperature with proper ventilation
 - d) In sealed bags with low humidity
4. What storage method is recommended for organic grains like rice and wheat to prevent mould growth and insect infestations?
 - a) Refrigeration at 0°C to 4°C
 - b) Airtight containers in a cool, dry place
 - c) Controlled atmosphere storage with low oxygen levels
 - d) Bulk silos with high humidity
5. What is the recommended utilisation method for crop residues to enhance sustainability?
 - a) Composting or vermicomposting
 - b) Direct disposal in landfills
 - c) Burning in open areas
 - d) Storing in sealed bags for long-term use

B. Fill in the Blanks

1. Organic produce is more susceptible to spoilage due to the absence of _____ and _____.
2. Organic fruits like strawberries, apples, and grapes are best stored at temperatures between _____ and _____ to slow down ripening and extend shelf life.
3. _____ and _____ are two organic by-product utilisation methods that help improve soil fertility and reduce waste.
4. Compliance with organic standards during transportation helps prevent _____ with non-organic products.
5. Organic grains like wheat, rice, and barley should be stored in airtight containers at a temperature range of _____ to _____.

C. State Whether the Following Statements are True or False.

1. Vermicomposting involves the use of anaerobic digesters to produce biogas and organic slurry.
2. Organic vegetables should be stored in areas with high humidity to prevent dehydration and wilting.
3. Organic herbs like thyme and rosemary are best stored in refrigerated conditions with high humidity.
4. Organic produce must be transported in dedicated vehicles to prevent contamination with non-organic products.
5. Environmental regulations and organic farming standards must be followed when utilising organic by-products.

D. Subjective Questions

1. A farmer stored strawberries in a refrigerator at a low temperature immediately after harvest. Explain how cold storage helps in maintaining the quality and shelf life of organic fruits.
2. A vegetable grower stored onions and garlic in a cool, dry, and well-ventilated room after curing them for one week. Why are curing and proper ventilation important for storing root crops?
3. A food processing unit converted fruit peels and crop residues into compost instead of burning them. Explain how composting supports sustainable organic farming practices.
4. An organic produce company used refrigerated trucks and separate packaging materials while transporting vegetables to the market. Explain why these transportation practices are necessary for organic produce.
5. A farmer maintained records of manure use, compost preparation, and soil testing on the farm. How do monitoring and record-keeping help in managing organic by-products effectively?

What have you learned?

After completing this session, you will be able to:

- classify storage practices suited to various organic produce types;
- describe ideal conditions like temperature, humidity, and ventilation for stored crops;
- identify methods to maintain nutritional value during storage; and
- explain techniques that reduce spoilage and extend shelf life.

Unit 2: Standards and Certification in Organic Farming

The Unit 2 introduces you to the principles and practices related to standards and certification in organic farming. It emphasises the importance of certification for ensuring product authenticity, building consumer trust, and accessing premium markets.

Session 1 on *National Standards for Organic Produce and Organic Products*, focuses on the regulations and guidelines that define organic farming and production at the national level. It covers the standards that must be followed by growers, producers, and handlers of organic produce and organic products to comply with recognised organic certification systems.

Session 2 on *Inspection and Certification Procedures for Organic Produce*, explains the process through which organic produce undergoes inspection and certification to achieve official organic status. It includes the various stages of inspection, such as field visits, verification of farming practices, review of records, and sample testing.

Session 3 on *Documentation and Record Management* describes the importance of maintaining proper records and documentation in the organic certification process. It covers the different types of records that farmers and producers need to maintain, including input usage, production practices, storage details, and sales records, to demonstrate compliance with organic standards.

Session 1: National Standards for Organic Produce and Organic Products

National standards for organic produce and products are a set of guidelines, regulations, and certification processes that govern the food composition, production, handling, processing, and labelling of organic agricultural products.

These standards are designed to ensure that products labelled as "organic" meet specific criteria that promote sustainability, environmental protection, and consumer health. Organic standards vary slightly from country to country, but they generally share core principles and practices.

1. Factors Affecting Food Quality

Food quality is influenced by a wide range of factors, from the conditions under which food is grown, harvested, processed, stored, and transported, to the handling and preparation before it reaches consumers. These factors can affect the sensory attributes (taste, texture, appearance, and smell), nutritional value, safety, and shelf life of food. Below are key factors that affect food quality:

- a) **Environmental factors:** The temperature, humidity, and rainfall during the growing season play a crucial role in determining the quality of crops. For example, drought or excessive rain can affect the size, taste, and appearance of fruits and vegetables. Also, the type of soil, its fertility, health and nutrient levels directly influence the growth and health of crops. Poor soil or unhealthy quality can lead to lower yields and produce with inferior taste or nutritional value.
- b) **Harvesting methods:** The stage at which a crop is harvested significantly affects its quality. Overripe or under-ripe produce may have poor taste, texture, and nutritional content. Timely harvesting ensures optimal flavour, texture, and colour. Improper handling during harvesting, such as bruising or damage, can affect the appearance, shelf life, and safety of food. Gentle handling to avoid physical damage and contamination is essential for maintaining quality.
- c) **Post-harvest handling:** Post-harvest cleaning to remove dirt, chemicals, or microbial contaminants is essential for food quality. If food is not cleaned properly, it may be unsafe for consumption and have an off-putting appearance. Improper storage conditions, such as temperature, humidity, and air circulation, can cause food to spoil or lose its freshness. For example, fruits and vegetables often require cool, controlled environments to prevent wilting, mould growth, or nutrient loss.
- d) **Processing methods:** The method of processing, such as cooking, freezing, drying, or canning, has a significant impact on food quality. Overcooking, for example, can degrade flavour, texture, and nutritional value. Freezing may cause the loss of nutrients and alter the texture of some foods. Packaging is essential to preserve the freshness, safety, and quality of food. Improper packaging can lead to contamination, spoilage, or loss of flavour.
- e) **Transportation and distribution:** Food that requires refrigeration or freezing must be transported under controlled conditions to maintain its quality. Fluctuating temperatures during transportation can lead to spoilage, freezer burn, or nutrient degradation. Long transportation times can affect food quality, especially for perishable fruits, vegetables, and dairy products. Foods that are transported for extended periods may lose texture, flavour and nutritional content.
- f) **Nutritional factors:** The nutritional quality of food, including vitamins, minerals, and antioxidants, is influenced by growing practices, soil quality, and processing methods. For example, foods grown in nutrient-rich soils may contain higher

levels of certain vitamins and minerals. Some food processing methods, such as high-heat treatments, can destroy sensitive nutrients like vitamins and enzymes. The choice of processing methods, such as blanching or freezing, can help minimise nutrient loss.

2. National Standards for Organic Food Production and Produce

National standards for organic food production and produce are designed to ensure that agricultural products labelled as "organic" meet specific criteria regarding their production, processing, handling, and labelling. These standards protect consumers from misleading claims, promote sustainable agricultural practices and guarantee the integrity of organic food. Organic standards vary by country, but they generally align with global principles to ensure consistency, traceability, and consumer confidence. Key aspects of national standards for organic food production and produce:

- i) **Organic certification:** To label food as organic, producers must comply with national organic standards and undergo a certification process by an accredited certifying body. This process includes regular inspections and audits of farming practices, production systems, and facilities. The main aspects of organic certification are as follows:
 - a) **Certified organic farms:** Farmers must be certified by an accredited certifying agency, which verifies that they adhere to organic practices and standards. This certification is usually renewed annually and involves on-site inspections, record-keeping, and traceability checks.
 - b) **Organic certification process:** The certification process includes application submission, farm inspection, and approval. Once certified, the producer receives a certificate that allows them to use the "organic" label on their produce.
- ii) **Organic farming practices:** Organic farming is based on principles that emphasise environmental sustainability, biodiversity, and the health of soil and ecosystems (Fig. 2.1). Key practices include the following:
 - a) **No synthetic chemicals:** Organic farms are prohibited from using synthetic pesticides, herbicides, or chemical fertilisers. Instead, natural or non-chemical methods are used to manage pests, weeds, and soil fertility (e.g., crop rotation, composting, and the use of organic fertilisers).
 - b) **Soil fertility and health:** Organic standards require farmers to maintain and improve soil health through practices like crop rotation, green manure, and composting. Organic matter is added to the soil to promote biodiversity, reduce erosion, and enhance soil structure and texture.
 - c) **Biodiversity:** Organic farms must prioritise biodiversity by promoting healthy ecosystems. This includes the use of cover crops, planting hedgerows, and

encouraging the presence of beneficial insects to support pollination and natural pest control.

- d) No GMOs (Genetically Modified Organisms):** Organic standards prohibit the use of GMOs in both production and processing. This includes organic seeds, which must be non-GMO, and the absence of GMOs in the food produced.



Fig. 2.1: Core principles of organic farming: (a) No synthetic chemicals, (b) maintenance of soil fertility through crop rotation and cover crops, (c) promotion of biodiversity, and (d) use of non-Genetically Modified Seeds.

- 3. Crop management:** For crops to be certified as organic, farmers must adhere to a range of prescribed management practices that promote ecological balance, maintain soil health, and minimise the use of external inputs.

a) Crop Rotation: Organic farming relies heavily on crop rotation to maintain soil fertility, improve soil structure, and reduce the incidence of pests, diseases, and weeds. By alternating crops with different nutrient requirements and rooting patterns, farmers can prevent nutrient depletion, enhance nutrient cycling, and reduce dependence on synthetic fertilisers.

b) Weed Management: Weed control in organic farming is primarily achieved through preventive, cultural, mechanical, and manual methods. Common practices include tillage, mulching, cover cropping, and hand weeding. While certain naturally derived herbicides may be permitted under organic standards, the use of synthetic herbicides is strictly prohibited.

c) Pest and Disease Management: Organic farming emphasises integrated and preventive approaches to pest and disease management. These include crop diversification, the use of resistant varieties, biological control agents, beneficial insects, traps, and physical barriers. Synthetic pesticides and fungicides are generally prohibited; instead, approved natural substances and ecological management practices are employed to minimise crop losses while maintaining environmental sustainability.

4. Organic food processing and handling: Organic standards extend to the processing, packaging, and handling of food products to ensure they maintain organic integrity throughout the supply chain:

- a) **No synthetic additives:** Organic food products must not contain synthetic preservatives, flavour enhancers, or artificial colourings. Natural or certified organic alternatives may be used in processing.
- b) **Separation from non-organic products:** To prevent contamination, organic products must be handled separately from non-organic products during processing, storage, and transportation. Dedicated facilities or equipment may be required for organic food production.
- c) **Processing methods:** Organic food processors must use methods that minimise the use of chemicals and other synthetic processes. Physical methods such as freezing, drying, and pasteurisation are often used to preserve food, and these processes must comply with organic standards.
- d) **Packaging:** Packaging materials used for organic products must be safe for contact with food and free from chemicals that could compromise the organic integrity of the product. Organic standards often encourage the use of environmentally friendly packaging.

5. Labelling and traceability: Accurate and clear labelling is crucial for organic products to inform consumers and prevent fraud (Fig. 2.2):

- a) **Organic labelling:** It is the certification process that identifies products grown and processed following organic farming standards, ensuring eco-friendly and chemical-free practices. Products must clearly indicate their organic certification, often with a logo or certification mark that is recognised nationally or internationally. This label must be accompanied by the name of the certifying agency and indicate the percentage of organic content (e.g., "100% Organic" or "Made with Organic Ingredients").
- b) **Traceability:** Organic certification requires a traceability system, where each step in the production and processing chain is recorded. This ensures that organic integrity is maintained and allows for product recalls if necessary. Farms, processors, and retailers must maintain records that trace the origin and movement of organic products.



Fig. 2.2: Labelling and traceability

6. Record-keeping and documentation: Organic producers must maintain detailed records of their activities, including crop production, pest management, inputs used (e.g., organic fertilisers), and sales. These records allow for transparency and accountability and are essential for certification audits. This documentation includes:

- Farm inputs:** A logbook of all seeds, fertilisers, pesticides, and other inputs used in organic farming. All inputs must be approved for use in organic agriculture.
- Sales and inventory:** Documentation of organic products sold, including invoices and shipment records, to maintain transparency throughout the supply chain.
- Inspection reports:** Records of regular inspections and audits by certifying agencies to ensure compliance with organic standards.

7. Harvesting Standards

Harvesting is a critical step in organic farming as it directly impacts the quality, safety, and shelf life of the produce. Organic harvesting standards are set to ensure that the process follows the principles of organic farming, emphasising sustainability, quality, and minimal environmental impact. These standards apply not only to the method of harvesting but also to the handling, storage, and post-harvest treatments of organic produce.

Here are the key aspects of harvesting standards for organic produce:

A. Timing of harvest: The timing of harvest is crucial to maintain the quality and nutritional value of organic produce. Harvesting should be done when the produce has reached its peak maturity but before it starts to overripe, which can affect quality.

- Maturity:** Organic produce should be harvested at the correct stage of maturity. This is determined based on the type of crop, its intended use (fresh or processed),

and market demand. Harvesting too early or too late can affect flavour, texture, and shelf life.

- b. **Seasonal considerations:** Organic producers must follow seasonal harvest schedules, ensuring that crops are harvested in line with local climates and growing conditions, which are also part of organic standards. Harvesting outside of these conditions may lead to reduced quality.

B. Harvesting methods: Organic standards require harvesting methods that protect the quality of the produce, minimise damage, and reduce environmental impact. The methods should also avoid contamination with prohibited substances.

- a. **Manual harvesting:** In most cases, organic produce is harvested manually, especially for delicate crops such as fruits and vegetables. Manual harvesting helps reduce mechanical damage, ensures that the produce is handled carefully, and avoids unnecessary environmental impact.
- b. **Mechanical harvesting:** When mechanical harvesting is used, organic standards require that the equipment be cleaned and maintained to avoid contamination with non-organic materials. Mechanical harvesting is more common for crops like grains or certain vegetables, but it should be done in a way that minimises damage to the crop.

C. Clean tools and equipment: Tools, such as knives, scissors, or harvesting machines, should be kept clean and free of any chemicals, fertilisers, or non-organic materials. This is critical in ensuring that there is no cross-contamination between organic and non-organic produce.

D. Handling during harvest: During the harvesting process, great care should be taken to ensure that the produce is not bruised, damaged, or exposed to contaminants. Handling practices should ensure produce is not contaminated by non-organic materials and should minimise stress to the plants.

- a. **Minimising damage:** Organic produce should be harvested with care to minimise bruising, crushing, or unnecessary damage. Damaged produce is more likely to spoil quickly and may not meet market standards.
- b. **Avoiding contamination:** Workers should be trained to handle the crops carefully and avoid any contact with harmful substances (e.g., synthetic pesticides or fertilisers) during the harvest process. Organic produce should be kept separate from non-organic crops to prevent cross-contamination.
- c. **Harvesting by hand vs. machine:** While harvesting by hand is preferred for many organic crops, machines can be used if they are cleaned thoroughly to prevent contamination. Any harvesting methods should ensure that the produce quality is not compromised.

E. Post-harvest handling and sorting: Once the produce is harvested, it is essential to handle and sort it according to organic standards to ensure that only the best quality is sent to market.

- a. **Sorting:** Organic produce should be sorted immediately after harvest to remove damaged or inferior items. This helps maintain the quality of the crop and ensures that only top-quality produce reaches consumers.
- b. **Cooling:** For perishable organic produce (e.g., fruits, vegetables, herbs), cooling methods such as refrigeration or hydro-cooling should be used to extend shelf life and maintain freshness. Cooling should be done immediately after harvest to avoid the rapid deterioration of produce.
- c. **Packaging:** Packaging should be done in a way that protects the produce from damage, contamination, and spoilage. Only materials approved for organic use (e.g., recycled cardboard) should be used for packaging.

F. Storage and transport: After harvesting, proper storage and transportation methods are crucial to maintaining organic integrity and quality:

- a. **Storage conditions:** Organic produce should be stored in clean, well-ventilated environments that are separate from non-organic produce. Temperature and humidity should be controlled according to the type of produce to maintain freshness.
- b. **No synthetic treatments:** Organic produce cannot be treated with synthetic preservatives or chemicals during storage. This includes the use of synthetic fungicides or ethylene gas for ripening.
- c. **Transportation:** Organic produce should be transported in clean, sealed containers to avoid contamination. The transport vehicles should be free of non-organic products and any substances that could affect the organic status of the produce. Organic produce should also be delivered within a specific timeframe to maintain quality and prevent spoilage.

8. Processing Method Standards

Processing organic produce involves transforming raw organic materials into consumable or marketable products while maintaining their organic integrity. The processing of organic products is governed by strict standards to ensure that they are free from synthetic chemicals, genetically modified organisms (GMOs), and other chemical/ non-organic substances. These standards help maintain the quality, safety, and sustainability of organic products, as well as protect the reputation of organic certification systems. The following is a breakdown of the processing method standards for organic produce and products:

- a) **Use of certified organic ingredients:** All ingredients used in the processing of organic food products must be certified organic. This includes not only the main ingredients but also any additives, flavourings, and processing aids. In some cases, when certain ingredients are not available organically, the use of non-organic ingredients may be allowed, but they must be approved for organic processing under specific circumstances. These are typically limited to a predefined list of non-organic ingredients approved by organic certification bodies (e.g., the National Organic Program in the U.S.).

- b) **Prohibition of synthetic chemicals:** The use of synthetic pesticides, herbicides, and chemical fertiliser is prohibited at all stages of the processing. Organic products must be processed without exposure to chemical residues. The use of artificial colours, flavours, preservatives, or emulsifiers is banned in organic processing. Only natural and permitted additives (e.g., certain natural preservatives, enzymes, etc.) can be used if they are compliant with organic standards.
- c) **Use of approved processing methods:** Organic processing methods should focus on physical techniques such as washing, grinding, cutting, fermentation, freezing, and drying. These methods help retain the nutrients and natural properties of the produce while minimising the use of chemicals. Also, thermal processes like pasteurisation, sterilisation, or cooking can be used to preserve organic products, but they must be done under conditions that maintain organic integrity (e.g., avoiding contamination with synthetic substances).
- d) **Avoidance of GMOs (Genetically Modified Organisms):** Organic standards strictly prohibit the use of GMOs in the processing of organic products. This includes not only GM ingredients but also GM enzymes, microorganisms, or any genetically engineered components. During processing, strict precautions must be taken to prevent contamination between organic and non-organic products, especially in facilities where both types are processed. Dedicated equipment, storage areas, and cleaning protocols must be maintained to prevent GMO contamination.
- e) **Facility standards and hygiene:** Processing facilities must be dedicated to organic products or must have clearly defined areas and equipment used exclusively for organic production. This avoids cross-contamination with non-organic products.
- f) **Organic certification and compliance:** Processing facilities must be certified by a recognised organic certification body, such as the USDA Organic or EU Organic certification. The certification process includes inspections, documentation reviews, and compliance checks to ensure that the facility meets organic standards. Organic processors must maintain records of sourcing, processing, and distribution. This includes information on suppliers, raw material sources, and processing methods, ensuring that every step of production complies with organic standards. Products that are processed and packaged as organic must be accurately labelled in compliance with organic certification standards.

9. Packing Standards

Packing standards for organic produce and products ensure that organic items are protected from contamination, preserved in optimal condition, and correctly labelled for consumer information and certification purposes. The packing process is an essential aspect of maintaining the quality and integrity of organic products throughout transportation, storage, and retail. Here are the key packing standards for organic produce and products:

- a) **Use of approved packing materials:** All packing materials used for organic products must be food-grade and non-toxic. They should not contain synthetic chemicals, pesticides, or any materials that could leach into the organic product.

and affect its quality or safety. Materials such as untreated wood, cardboard, glass, and certain plastics that do not contain harmful chemicals are preferred. On the other hand, packing materials should ideally be recyclable, biodegradable, or compostable. This helps maintain the environmental integrity of organic products and reduces the ecological footprint. For example, some organic produce can be packed in biodegradable containers or recyclable cardboard boxes instead of plastic.

- b) **Segregation of organic and non-organic products:** If a facility processes both organic and non-organic products, separate areas and equipment must be used for organic packing. This helps avoid cross-contamination with non-organic substances or the mixing of organic and non-organic produce. Organic products must be packed in a way that prevents contamination from synthetic chemicals or non-organic materials. This includes cleaning equipment thoroughly and using separate tools or containers for organic produce.
- c) **Preservation of product integrity:** Packing materials must adequately protect organic produce from physical damage such as bruising, crushing, or spoiling. For example, delicate fruits like berries may require special packaging, such as clamshell containers or cushioned packing, to minimise damage during transport. For perishable items like fruits, vegetables, and herbs, packaging should provide adequate ventilation to allow airflow, which helps prevent excess moisture build-up, mould growth, and premature spoilage. Packaging should help regulate moisture levels to extend the shelf life of the product. For example, some fruits may require absorbent materials to prevent excess moisture in the packaging.

10. Labelling Standards

- i) **Labelling:** Any written, printed, or visual material on, with, or near food that provides information or promotes its sale. Organic products must be clearly labelled with the appropriate certification seal, such as USDA Organic or EU Organic, depending on the certification body. This assures consumers that the product complies with organic standards.



Fig. 2.3: India Organic's logo with colour specifications

Clear Product Information: Labels should contain essential information such as:

1. Product name
2. Name of the producer or processor
3. Certification body
4. Organic certification number
5. Batch or lot number (for traceability)
6. Harvest or production date
7. Storage instructions

This information is critical for traceability and consumer confidence, as well as compliance with organic standards.

ii) **Labelling Standards:** Labelling is a critical aspect of organic food production, ensuring transparency, consumer trust, and compliance with organic certification requirements. Organic labelling provides essential information about the product's origin, certification, and quality. In most countries, organic products must adhere to strict labelling standards to communicate their authenticity and meet regulatory requirements. Below are the key labelling standards for organic produce:

- a) **Certification marks and organic seals:** Certification marks and organic seals are official symbols or logos (Fig. 2.4) placed on organic products to indicate compliance with organic farming, processing, and labelling standards. These marks assure consumers that the product meets rigorous organic certification requirements, providing trust in the integrity of the organic claim.



Fig. 2.4: Sample of official symbols or logos used for the organic products

- b) **Product name and description:** The product name and description are critical components of organic product labelling, designed to clearly identify the product while providing consumers with essential and accurate information. A well-defined product name and description ensure transparency, compliance with regulatory standards, and effective communication with the target market.
- c) **Product origin and traceability:** Product origin and traceability are essential elements in organic food production, ensuring transparency, quality assurance, and compliance with organic standards. These aspects provide consumers with

confidence in the authenticity and integrity of organic products and allow producers to monitor and verify the journey of their goods from farm to fork.

- d) **Storage and handling instructions:** Proper storage and handling instructions are essential for maintaining the quality, safety, and shelf life of organic produce and products. These instructions ensure that the integrity of the organic product is preserved from production to consumption.
- e) **Allergen and nutritional information:** Providing clear allergen and nutritional information on organic food labels is essential for consumer safety, informed decision-making, and regulatory compliance. This information allows consumers to make choices based on dietary needs, health goals, or potential allergen concerns.

11. Storage Standards

Storage standards are critical to maintaining the quality, safety, and organic integrity of organic products. These standards ensure that organic goods remain uncontaminated, fresh, and compliant with certification requirements throughout their shelf life.

- a) **Separation and segregation:** Organic products must be stored separately from conventional products to prevent cross-contamination. Also, use designated areas or containers exclusively for organic products.
- b) **Environmental controls:** Maintain optimal temperature ranges to preserve freshness:
 - a. Fresh Produce: 0°C to 5°C (32°F to 41°F).
 - b. Frozen Products: Below -18°C (0°F).
 - c. Dry Goods: 10°C to 15°C (50°F to 59°F).

High-humidity environments (85-95%) for leafy greens and soft fruits. Low-humidity storage for grains, seeds, and dried goods to prevent mould.

- c) **Cleanliness and pest control:** Regularly clean storage areas and containers using approved organic cleaning agents. Also, use organic-compliant methods like biological controls, natural repellents, and physical barriers.
- d) **Packaging:** Use eco-friendly, food-grade materials that comply with organic standards. Ensure packaging is sealed and durable to protect against damage, contamination, and moisture ingress.

12. Transport Standards

Transport standards ensure the organic integrity, quality, and safety of products during transit. These standards address separation, contamination prevention, climate control, and compliance with organic certification requirements.

- a) **Clean and dedicated transport:** Ensure transport vehicles are thoroughly cleaned to prevent contamination. Use vehicles or compartments specifically designated for organic products whenever possible.
- b) **Temperature and climate control:** Maintain the cold chain for items. Example: Fresh fruits and vegetables require 0°C to 5°C (32°F to 41°F).

- c) **Documentation and labelling:** Label products as "Organic" and ensure batch numbers are visible for traceability. Ensure shipment records include certificates, inspection reports, and detailed transport information.
- d) **Avoiding contamination:** Ensure organic products are not exposed to non-organic substances, including synthetic pesticides, fertilisers, or non-compliant cleaning agents. Use appropriate padding or separation to prevent bruising or crushing during transit.

Practical Exercise

Activity 1: Study the regulations and standards required to access domestic and international markets for organic products

Materials Required:

1. Notebook
2. Pen/pencil for note-taking
3. Computer or tablet with internet access for research
4. Access to documents from certification bodies (e.g., USDA Organic, EU Organic)
5. List of international certification standards (e.g., Fair Trade, GlobalGAP)

Procedure:

- Study regulations specific to domestic and international organic markets, including labelling requirements, production standards, and processing rules. Focus on requirements such as soil health, pest management, crop rotation, and non-GMO standards.
- Study the differences in organic certification between countries (e.g., USDA vs. EU Organic certification).
- Compile findings into a report or presentation highlighting the necessary steps to access organic markets.
- Optionally, consult with local farmers or exporters who have experience with organic certification and market access.

Check Your Progress

A. Multiple Choice Questions

1. What is the primary purpose of national standards for organic produce and products?
 - a) To promote the use of synthetic chemicals in farming
 - b) To ensure consistency, traceability, and consumer confidence in organic food
 - c) To reduce the price of organic products
 - d) To make organic products more appealing through advanced marketing methods

2. Which of the following is NOT allowed in organic farming practices?
 - a) Synthetic pesticides
 - b) Crop rotation
 - c) Use of organic fertiliser
 - d) Mechanical weed control
3. Which method is generally preferred for harvesting organic produce?
 - a) Manual harvesting
 - b) Mechanical harvesting
 - c) Automated harvesting machines
 - d) No specific preference
4. What is the main concern when transporting organic produce?
 - a) To ensure that it is stored at high temperatures
 - b) To avoid contamination from synthetic chemicals or non-organic products
 - c) To ensure faster delivery times
 - d) To maintain high levels of humidity
5. What is the key factor that determines the maturity of organic produce during harvest?
 - a) Market demand
 - b) The type of crop and its intended use
 - c) Availability of workers
 - d) Growing conditions in other countries
6. Which of the following is a prohibited substance in organic food processing?
 - a) Natural preservatives
 - b) Artificial colourings
 - c) Organic vinegar
 - d) Certified organic additives
7. Why is traceability important in the organic certification process?
 - a) To allow for product recalls if necessary
 - b) To track the harvest dates of organic produce
 - c) To reduce transportation costs
 - d) To improve the marketing of organic products
8. What is the primary consideration when selecting packaging materials for organic produce?
 - a) The material's ability to preserve the colour of the produce
 - b) The material's ability to keep the product at a high temperature
 - c) The material's non-toxicity and environmental friendliness
 - d) The material's ability to prevent damage from sunlight
9. What practice is used to maintain soil fertility in organic farming?

- a) Use of chemical fertilisers
 - b) Crop rotation and composting
 - c) Continuous monoculture
 - d) Over-irrigation of crops
10. What is required for a product to be labelled as organic?
- a) The product must be grown in a greenhouse
 - b) The product must have a synthetic pesticide residue
 - c) The producer must undergo an organic certification process
 - d) The product must be genetically modified

B. Fill in the Blanks

1. National standards for organic produce ensure that agricultural products labelled as "organic" meet specific criteria regarding _____, _____, handling, and labelling.
2. _____ methods such as crop rotation and composting are essential practices in organic farming to maintain soil health.
3. Proper post-harvest handling helps maintain food _____, ensuring freshness, safety, and shelf life.
4. Organic standards prohibit the use of _____ during processing, which includes artificial preservatives, colourings, and GMOs.
5. Organic packing materials should be _____ to maintain environmental integrity and reduce ecological impact.

C. State Whether the Following Statements are True or False.

1. GMOs are permitted under organic certification as long as they are used during post-harvest handling only.
2. Organic food processors are allowed to use synthetic additives and preservatives under certain conditions.
3. Proper labelling, including the certification seal and batch number, is essential for maintaining the traceability of organic products.
4. Harvesting organic crops at the correct stage of maturity ensures better taste, texture, and shelf life.
5. Organic certification requires that producers undergo regular inspections to ensure compliance with organic standards.

D. Subjective Questions

1. A farmer used crop rotation and composting instead of chemical fertilisers on his farm. Explain how these organic farming practices help maintain soil fertility and environmental sustainability.
2. An organic food company stored organic grains separately from conventional grains and maintained proper records during transportation. Why are segregation and traceability important in organic certification?

3. A vegetable grower harvested tomatoes carefully by hand and immediately cooled them before packaging. Explain how proper harvesting and Post-harvest handling help maintain the quality of organic produce.
4. An organic juice processing unit avoided artificial colours and preservatives while producing packaged juice. Why are synthetic additives prohibited in organic food processing?
5. A retailer transported organic fruits in refrigerated vehicles with proper labels and certification details. Explain how transport standards and labelling help maintain organic integrity and consumer trust.

What have you learned?

After completing this session, you will be able to:

- explain the national standards and certification requirements for organic produce and organic products;
- demonstrate knowledge of organic farming, harvesting, processing, packaging, storage, and transport standards;
- describe the importance of labelling, traceability, and record-keeping in maintaining organic integrity; and
- apply appropriate organic handling and management practices to ensure food quality, safety, and compliance with certification standards.

Session 2: Inspection and Certification Procedures for Organic Produce

The certification of organic produce ensures that products meet established organic standards throughout their production, processing, and distribution. This process involves a series of steps, from application to inspection and final approval, to verify compliance with organic regulations.

Inspection is a critical component of the organic certification process, ensuring compliance with organic standards. It involves thorough on-site assessments to verify that farming practices, inputs, and produce meet the criteria established by regulatory bodies for organic integrity. The main purpose of inspection is to ensure adherence to organic standards (e.g., USDA, EU Organic, India Organic), confirm that no prohibited substances or practices are used, verify records and practices for accountability across the supply chain and provide assurance of the authenticity of organic claims.

1. Steps in the Inspection Process

The inspection process for organic produce is designed to ensure that all practices from farm to final product comply with established organic standards. These steps verify that organic integrity is maintained in the production, handling, and distribution of the produce. Below are the outlines of the key steps involved in the inspection process for organic produce:

- a) **Pre-inspection preparation:** Inspectors study the farm's application and submitted documentation. A detailed inspection plan is developed, including a visit schedule and checklist.
- b) **On-site inspection:** Inspectors meet with the farm owner or manager to discuss the inspection process and clarify questions. Inspectors evaluate crop rotation, composting, and soil health, Usage of organic-approved fertilisers, pest control, and seed sources and absence of synthetic chemicals and genetically modified organisms (GMOs).
- c) **Record verification:** Inspectors verify documentation, including the following:
 - Input purchase records (e.g., seeds, compost).
 - Crop planting and harvesting logs.
 - Pest and weed management records.
 - Sales and distribution records.
- d) **Sampling and testing:** Inspectors may collect soil, water, or produce samples for testing to detect prohibited substances.
- e) **Closing meeting:** Inspectors provide preliminary feedback, highlight any non-compliance issues, and outline the next steps.

2. Certification Process

Organic certification is a multi-step process that verifies the compliance of farming, processing, and handling practices with established organic standards. This process ensures transparency and integrity in the organic food supply chain, from production to the final consumer. Below is an overview of the certification process, covering key elements such as standards, compliance, planning, documentation, inspection, fees, and record-keeping.

- a) **Organic standards:** Organic standards provide a framework for ensuring that agricultural and processing practices comply with sustainable, environmentally friendly, and health-conscious principles. These standards form the foundation of the organic certification process, ensuring the integrity of organic products and maintaining consumer trust.
- b) **Compliance:** Compliance in the organic certification process refers to meeting the specific requirements set by organic standards and regulatory frameworks. This ensures that organic produce adheres to principles of sustainability, environmental protection, and consumer safety. Compliance begins with a thorough understanding of the applicable organic standards set by national or international regulatory authorities, such as:
 - USDA National Organic Program (NOP)
 - European Union Organic Regulation
 - India Organic (NPOP)
 - Codex Alimentarius
- c) **Planning for certification:** It involves careful preparation, documentation, and adherence to organic standards. By understanding requirements, developing a robust Organic System Plan, and maintaining proper records, producers can ensure a smooth certification process. Thoughtful planning not only facilitates

compliance but also enhances the long-term sustainability and profitability of organic operations.

- d) **Documentation for certification:** Documentation plays a critical role in the organic certification process, serving as evidence that an operation complies with organic standards. Maintaining accurate and comprehensive documentation is vital for successfully achieving and retaining organic certification. These records not only demonstrate compliance but also enhance traceability, build consumer trust, and support the overall integrity of organic production systems. Regularly updating and organising documentation ensures smooth inspections and facilitates ongoing certification.
- e) **Inspection:** It is a critical step in the organic certification process. It ensures that the operation complies with organic standards and practices, as outlined in the Organic System Plan (OSP). Inspections are conducted by accredited certification bodies and are thorough, transparent, and systematic. Key objectives of inspection are:
 - i. Confirm that farming, processing, handling, and storage comply with organic standards.
 - ii. Ensure organic integrity from production to sale, preventing contamination or commingling with non-organic products.
 - iii. Verify that records accurately reflect practices and meet certification requirements.
- f) **Fee:** The fees associated with organic certification vary depending on the size, complexity, and location of the operation. While certification can be an investment, the benefits of accessing premium markets, meeting consumer demand, and promoting sustainable practices often outweigh the costs. By planning and leveraging available support programs, producers can make the process more affordable. The fees include application, inspection, annual certification, renewal, additional charges, testing, and other associated costs with the certification process.
- g) **Record keeping:** It is a fundamental requirement for obtaining and maintaining organic certification. It ensures transparency, accountability, and traceability in organic production, processing, and handling. Certification bodies rely on accurate and comprehensive records to verify compliance with organic standards.

3. Operational Structure of the National Programme for Organic Production

The National Program for Organic Production (NPOP) is an initiative by the Government of India, primarily managed by the Ministry of Commerce and Industry, to regulate and promote organic farming and organic products. The program establishes standards, processes, and a certification system to ensure the integrity of organic produce and enhance its global acceptance.

Key components of the NPOP operational structure: The National Program for Organic Production (NPOP) is a comprehensive framework designed to regulate and promote organic farming in India. Its operational structure is built around key components that ensure transparency, compliance, and international recognition. The components and their responsibilities are as follows:

- 1) **Apex authority:** Ministry of Commerce and Industry (MoCI)
 - Serves as the central authority for policy formation and oversight.
 - Liaises with international organisations for equivalence and trade agreements.
 - Ensures alignment with national agricultural goals and export strategies.
- 2) **National Steering Committee (NSC):** Composed of representatives from various government ministries, scientific bodies, and stakeholders. Their role are as follows:
 - Provides overall guidance for implementing NPOP.
 - Approves policies, standards, and operational guidelines.
 - Reviews progress and addresses issues related to organic production.
- 3) **Agricultural and Processed Food Products Export Development Authority (APEDA):** A statutory body under the MoCI that acts as the implementing agency for NPOP. The major functions of this body are as follows:
 - Develops and updates organic standards.
 - Accredits certification bodies (CBs) and ensures their compliance with NPOP guidelines.
 - Maintains the Tracenet System, a web-based traceability platform for tracking organic products throughout the supply chain.
 - Facilitates export promotion and equivalence recognition with international markets.
- 4) **Accreditation agencies:** Appointed by APEDA to manage and supervise the certification process:
 - Evaluate and accredit certification bodies based on NPOP guidelines.
 - Conduct regular audits and reviews of certification bodies.
 - Ensure uniformity and credibility in the certification process.
- 5) **Certification Bodies (CBs):** Independent organisations authorised by APEDA to certify organic practices and operations:
 - Conduct inspections of farms, processors, and handlers to verify compliance with organic standards.
 - Issue organic certificates to compliant operators.
 - Monitor and maintain records of certified operators.

Key features of NPOP operational structure: The National Program for Organic Production (NPOP) is designed to regulate, promote, and certify organic farming practices in India. Its operational structure is built to ensure effective implementation, compliance with organic standards, and alignment with international norms. Below are the key features of the NPOP operational structure:

- i) Certification and inspection are carried out by accredited independent bodies.
- ii) Tracenet ensures the transparency and integrity of organic produce.
- iii) Standards align with major international organic programs, facilitating exports.

- iv) Collaboration between the government, private sector, and farmer groups for effective implementation.

Practical Exercise

Activity 1: Study of organic certification requirements

Material Required:

1. Notebook
2. Pen
3. Reference material/textbook

Procedure:

- List major organic standards (USDA, EU Organic, NPOP).
- Identify key compliance requirements for certification.
- Note important elements like documentation, inspection, and record keeping.
- Summarise the requirements in points.

Activity 2: Analysis of documentation in organic certification

Material Required:

1. Notebook
2. Pen

Procedure:

- Identify different types of records (input, crop, sales, pest management).
- Observe how documentation supports traceability.
- List the importance of maintaining accurate records.
- Record observations in brief points.

Activity 3: Market visit to study organic food labelling and sales

Materials Required:

1. Notebook and pen
2. Smartphone or camera
3. Observation checklist for labelling and sales

Procedure:

- Organise a visit to a local market, supermarket, or organic food store.
- Examine how organic foods are labelled. Note the types of labels, certifications, and any specific claims (e.g., “100% Organic”).
- Observe the presentation and marketing strategies for organic products.
- Record the variety of organic products available and their pricing.
- Evaluate how the observed labelling aligns with national or international organic certification standards.

- Write a brief report on observations, focusing on labelling practices, sales strategies, and consumer engagement.
- Discuss findings, highlighting insights about organic food marketing and compliance with regulations.

Check Your Progress

A. Multiple Choice Questions

1. What is the primary purpose of the inspection process in organic certification?
 - a) To provide feedback to farmers
 - b) To ensure adherence to organic standards
 - c) To increase the yield of organic farms
 - d) To promote organic food to consumers
2. Which of the following is NOT part of the inspection process for organic produce?
 - a) Evaluating crop rotation and soil health
 - b) Verifying records of pesticide use
 - c) Sampling soil and water for prohibited substances
 - d) Confirming compliance with organic certification standards
3. What is the role of the Agricultural and Processed Food Products Export Development Authority (APEDA) in the National Program for Organic Production (NPOP)?
 - a) To provide financial assistance to organic farmers
 - b) To develop and update organic standards
 - c) To conduct inspections of organic farms
 - d) To promote the use of genetically modified crops
4. Which of the following best describes the relationship between the Ministry of Commerce and Industry (MoCI) and the NPOP?
 - a) MoCI serves as the implementing agency for organic certification
 - b) MoCI is responsible for managing certification bodies
 - c) MoCI provides policy formation and oversight for the NPOP
 - d) MoCI handles public awareness campaigns for organic food
5. What is a key advantage of having a certification body (CB) in the organic certification process?
 - a) They provide funding to organic farms
 - b) They independently assess compliance with organic standards
 - c) They directly sell organic products to consumers
 - d) They manage the application process for organic certification

6. How does the Tracenet system support organic certification under NPOP?
 - a) By providing financial support to organic farmers
 - b) By tracking and ensuring the traceability of organic produce
 - c) By promoting organic food to international markets
 - d) By verifying the use of synthetic pesticides in organic farming
7. Why is record-keeping crucial in the organic certification process?
 - a) It helps farmers track crop production costs
 - b) It ensures compliance with organic standards and maintains traceability
 - c) It prevents contamination of crops from non-organic products
 - d) It provides a marketing tool for selling organic produce
8. Which of the following is required during the pre-inspection preparation for organic certification?
 - a) Developing a marketing plan for organic products
 - b) Inspectors studying the farm's application and documentation
 - c) Hiring additional staff for farm inspections
 - d) Preparing a list of all genetically modified organisms on the farm
9. What is one of the main objectives of organic certification fees?
 - a) To fund the organic farming research
 - b) To compensate for the costs associated with inspection and certification
 - c) To support the promotion of non-organic products
 - d) To subsidise farmers for purchasing organic seeds
10. What is the primary benefit of planning for organic certification?
 - a) To increase the financial cost of certification
 - b) To ensure compliance with organic standards and ensure smooth certification
 - c) To reduce the number of inspections needed
 - d) To improve marketing strategies for organic products

B. Fill in the Blanks

1. The primary purpose of the organic certification process is to ensure that products meet established _____ throughout their production, processing, and distribution.
2. _____ is a web-based traceability platform maintained by APEDA to track organic products throughout the supply chain.
3. The _____ under the Ministry of Commerce and Industry serves as the apex authority responsible for policy formation and oversight in the National Program for Organic Production (NPOP).
4. Organic certification fees may include charges for application, inspection, annual certification, renewal, and _____.
5. _____ records, such as input purchase logs and pest management records, play a critical role in verifying compliance with organic standards during the inspection process.

C. State Whether the Following Statements are True or False.

1. The National Steering Committee (NSC) provides overall guidance for implementing NPOP and reviews progress in organic production.
2. Inspection of organic farms primarily involves online evaluations rather than on-site visits.
3. The Tracenet system is designed to ensure the transparency and traceability of non-organic products.
4. The organic certification process aims to prevent contamination and commingling with non-organic products.
5. Accredited certification bodies (CBs) are responsible for conducting inspections and issuing organic certificates to compliant operators.

D. Subjective Questions

1. A farmer applying for organic certification maintained records of seeds, compost use, and crop harvesting activities. Explain why documentation and record-keeping are important in the organic certification process.
2. During an inspection visit, samples of soil and vegetables were collected from an organic farm for testing. Why is sampling and testing necessary in organic certification?
3. A processing unit wanted to export certified organic products to international markets. Explain how APEDA and the NPOP system help in maintaining the credibility of organic products.
4. An inspector found that a farm was using unapproved chemical fertilisers while claiming to produce organic vegetables. What impact would this have on certification compliance and consumer trust?
5. A certification body conducted regular inspections and audits of an organic food company before issuing certification. Explain how inspections help ensure organic integrity from production to sale.

What have you learned?

After completing this session, you will be able to:

- explain the inspection and certification procedures followed for organic produce and products;
- describe the role of documentation, compliance, and record-keeping in the organic certification process;
- identify the functions of npop, apeda, certification bodies, and accreditation agencies in organic certification; and
- apply organic standards and inspection requirements to ensure transparency, traceability, and organic integrity.

Session 3: Documentation and Record Management

Documentation and record management are essential for organic certification, ensuring the traceability of all farming activities, from field preparation and planting to harvesting and sales. While there are no specific requirements on how to record the information, it must be in a written format that is clear and understandable for organic inspectors. In some instances, sample forms are provided to assist, while in other cases, original documents like receipts must be maintained.

Keep records of all the seeds, planting stock, harvesting, selling, transport and input materials (fertiliser, compost, soil amendments, planting mixes, etc.) we used. For example:

- i) Receipts for purchases
- ii) Production records for transplants or input materials she/he produce himself
- iii) Maintain harvest records for seeds saved from personal production.
- iv) Keep harvesting records
- v) Invoices, sales receipts, sales summaries

Certified organic production can best be described as a comprehensive, rigorous identity-preservation system. For instance, a field crop operation must keep detailed records on all inputs used, all field activities, harvest, storage and transfer of crops. It must be possible to trace every crop or product from the field.

1. Types of Record Keeping

Organic farming requires certification, which is granted based on the required documents and records maintained by the farmer. Therefore, farmers must keep their records updated with all the information required by the certification agency. The common types of records maintained in organic farming include:

- Input records
- Crop production records
- Irrigation records
- Pest and disease management records
- Harvest and storage records
- Sales and marketing records
- Inspection and certification records

Record-keeping provides valuable information about which farming methods and practices are effective. Farm records help farmers understand the contribution of each enterprise to the overall progress and profitability of the farm.

Farm records also provide important data for farm planning and budgeting. A farmer planning to modify farming activities needs information about expected crop and livestock yields, production costs, and possible income. Proper record-keeping helps farmers assess farm performance and determine how much profit is being earned.

2. Importance of keeping farm records for farmers

Before outlining the different types of farm records, it is important to first understand their significance:

- Farm records help a farmer to keep track of stock and manage each aspect of the farm properly.
- They are important for planning and budgeting. They provide a farmer with enough information needed for proper planning and budgeting at every point in time.
- They help farmers know the progress and contributions of each aspect of the farm to its overall success.
- They are important for proper farm management.
- They can be very helpful when a farmer needs to access financial aid from banks or other financial institutions.

3. Organic Product Certificate

The certifier, at the request of the operator, will issue a product certificate to the buyer, at a cost to be borne either by the operator or the buyer. The product certificate shall contain the following:

- Name and description of the seller name
- Description of the buyer
- Date of delivery of the product
- Date of issuing of certificate
- Quantity and season
- Lot numbers and other identification (marks) of the products
- Reference to invoice or bill of lading
- Authorised Inspection and Certification Agency

Wherever applicable, the original certification of raw materials and any other certification from another programme shall be indicated on product certificates. Copies of transaction certificates issued to operators shall be stored in a manner that enables easy retrieval of information on each operator.

4. Certification Agencies

The Government of India has various agencies under the certification bodies to manage certification procedures for organic production in the country. Agricultural and Processed Food Products Export Development Authority (APEDA), one of the certified bodies, has identified 24 certification agencies to process the certification procedures throughout the country. The current licensed agencies can be confirmed from the NPOP website.

India Organic is a certification mark for organically farmed products, issued by accredited centres under the Government's NPOP scheme. The USDA regulates organic produce in the U.S. through the National Organic Program, setting standards for production, handling, and labelling.

There are two types of certification agencies

- Indian certification agencies
- International certification agencies

The above agencies are organisations that provide conformity assessments, including testing, inspection, and certification, to ensure products, services, or systems meet specific standards or regulatory requirements. These agencies operate at national and international levels, covering areas like quality, safety, environmental management and more.

Practical Exercise

Activity 1: Importance of record keeping in farm management.

Materials Required:

1. Pen and paper
2. Labour logs
3. Sales records

Procedure:

- Identify different types of records useful for farm management, considering crops, tools, resources, and market conditions.
- List the essential records to manage farm resources effectively, including financial, crop production, labour, and sales.
- Write a paragraph explaining how these records benefit farmers in decision-making, financial management, and improving farm productivity.
- Share and discuss all the observations with classmates or in a group. How does record-keeping improve productivity and efficiency in farming?

Activity 2: Visit to an organic farm for understanding record keeping.

Materials Required:

1. Notebook
2. Pen
3. Camera
4. Access to an organic farm
5. Observation guidelines

Procedure:

- Visit an organic farm and observe the record-keeping practices related to crop growth, resource usage, and finances.
- Take notes on how the farm maintains records to ensure health, productivity, and compliance with organic certification standards.

- Reflect on the importance of organised records in organic farming and discuss the findings.

Check Your Progress

A. Multiple Choice Questions

- Which of the following records is required for organic certification?
 - Crop yield predictions
 - Sales receipts and invoices
 - Employee wages
 - Weather patterns
- Why is it essential for a farmer to maintain accurate farm records for organic certification?
 - To monitor crop colours
 - To ensure compliance with organic standards
 - To track the farm's social media engagement
 - To keep track of personal expenses
- What type of records must be maintained for inputs used in organic farming?
 - Planting schedules only
 - Receipts for purchases and production records for inputs
 - Crop rotation plans
 - Market trends
- How does maintaining farm records assist in farm management?
 - It helps in budgeting and planning for future crops
 - It allows for a better understanding of weather patterns
 - It provides a history of seed varieties used
 - It tracks employee performance
- Which of the following is an example of a document that can be part of the record-keeping for organic certification?
 - Harvest records
 - Monthly weather reports
 - Employee performance evaluations
 - Social media activity
- What is the primary role of the organic product certificate?
 - To list the pesticides used
 - To verify the authenticity of organic products for the buyer
 - To track product expiration dates
 - To indicate farm ownership

7. Which of the following must be included in a product certificate issued for organic products?
- a) Production cost details
 - b) Date of delivery, quantity, and season of the product
 - c) Names of all farm workers involved
 - d) Weather conditions during the harvest

B. Fill in the Blanks

1. Organic certification helps ensure the _____ of all farming activities, from planting to harvesting and sales.
2. Farm records provide essential information for _____ and budgeting, helping farmers plan future activities effectively.
3. Certified organic products can be traced from the field through a comprehensive _____ system.
4. The certification mark for organically farmed products in India, issued under the NPOP scheme, is called _____.
5. _____ sales receipts provide insight into the financial aspects of livestock production, tracking the sale of animals and related revenue.

C. State Whether the Following Statements are True or False.

1. APEDA, under the Government of India, is responsible for accrediting certification agencies to process organic certification in the country.
2. Certification agencies only operate at a national level and do not engage in international conformity assessments.
3. Copies of transaction certificates issued to operators must be stored to enable easy retrieval of information.
4. Crop sales receipts provide information about yields and market trends, helping farmers evaluate production success.
5. The USDA regulates organic produce in India through the National Organic Program (NOP).

A. Subjective Questions

1. A farmer maintained records of seed purchases, compost use, irrigation, and harvesting activities throughout the year. Explain how proper record-keeping helps in obtaining organic certification.
2. A bank asked an organic farmer to provide farm records before approving an agricultural loan. Why are farm records important for financial planning and support?
3. An organic produce buyer requested a product certificate before purchasing vegetables from a certified farm. Explain the importance of an organic product certificate in maintaining consumer trust and traceability.
4. A certification inspector checked the farmer's sales receipts, harvest records, and pest management records during a farm visit. Why are these records necessary during inspection and certification?

5. A farmer wanted to compare the profit earned from two different crops grown on the farm. Explain how farm records can help in farm planning, budgeting, and decision-making.

What have you learned?

After completing this session, you will be able to:

- explain the importance of proper documentation and record-keeping in the organic certification process;
- identify the key types of documentation that farmers and producers must maintain, such as input records, production methods, and sales data;
- define effective record-keeping practices to demonstrate compliance with organic standards; and
- recognise how accurate documentation supports the inspection and certification process and enhances transparency.

UNIT 3 Marketing of Organic Produce

The Unit 3 on *Marketing of Organic Produce* is designed to provide knowledge and skills required to successfully market organic products in a competitive and evolving marketplace. The unit focuses on understanding the unique characteristics of organic produce, the challenges and opportunities in the organic sector, and the strategies required to effectively reach and engage consumers.

Session 1 on *Types of Organic Farming Enterprises, Policies and Regulations*, introduces the different types of enterprises operating in the organic sector, including organic farms, processors, wholesalers, retailers, and export-oriented businesses. The session also explains the policies, regulations, and standards governing the production, certification, and marketing of organic produce.

Session 2 on *Marketing Channels, Functionaries and Strategies*, explains the different marketing channels and functionaries involved in the organic supply chain, such as distributors, wholesalers, retailers, cooperatives, and direct-to-consumer platforms. The session also covers various marketing strategies for organic products, including branding, pricing, packaging, promotion, product positioning, and distribution methods.

Session 3 on *Organisations and Agencies Supporting Organic Produce Marketing*, focuses on the role of various organisations, institutions, and agencies involved in the promotion and marketing of organic produce. The session explains the contribution of government bodies, certification agencies, cooperatives, NGOs, and

export promotion organisations in supporting farmers, increasing awareness, and improving market access for organic products.

Session 1: Types of Organic Farming Enterprises, Policies and Regulations

There are different types of business ownership, each with its own structure. Options include sole proprietorship, partnership, limited partnership, Limited Liability Company (LLC), corporation (for-profit), nonprofit corporation, and cooperative. Choosing the right structure is important, as it affects how the business is organised, taxed, and managed.

1. Types of Businesses

The marketing of organic produce involves businesses operating at various stages of the supply chain, from production to end consumers. These businesses can be categorised into the following types:

- a) **Sole proprietorship:** The most common and simplest type of business ownership is the sole proprietorship. In a sole proprietorship, a single individual engages in a business activity without the necessity of formal organisation. It is simple to create as there is no legal formality necessary to be completed, but it also has unlimited liability. Eg, Individual entrepreneurs and farmers.
- b) **Partnership and limited partnership:** A partnership may be defined as the relation between persons who have agreed to share the profits of a business carried on by all or any of them acting for all. There are generally two types of partnerships, including a general and a limited partnership. There are benefits and disadvantages to each one, particularly in terms of the tax implications and business structure for managers, members, and shareholders.
- c) **Corporation:** It is a form of private ownership which contains features of a large partnership as well as some features of the corporation. A large business organisation that is legally separate from its owners (shareholders). Its main aim is usually profit-making. The main aim of the cooperative is to eliminate profit and provide goods and services to the members of the cooperative at cost. Eg. Tata, Reliance
- d) **Limited liability company:** A form of business ownership that is taxed like a partnership but enjoys the benefits of a limited liability, like a corporation, is a “limited liability company”. In comparison to a corporation, it is simpler to organise and does not receive double taxation. While simultaneously receiving more credibility than a partnership or sole proprietor, when it comes to gathering resources such as working capital. Unfortunately, this form of ownership is usually reserved for a group of professionals such as

accountants, doctors and lawyers. Eg, AGN1 Organics Pvt. Ltd, Organic India Pvt. Ltd.

- e) **Non-profit:** A non-profit business, also known as a not-for-profit organisation, is a tax-exempt organisation formed for religious, charitable, literary, artistic, scientific, or educational purposes. It is an incorporated business from which its shareholders or trustees do not benefit financially. Eg, Navdanya is an Indian-based non-governmental organisation.
- f) **Co-operation:** Cooperatives are member-owned organisations with democratic control, where each member has an equal vote, and profits are shared based on ownership. In other words, a member-owned organisation formed to serve the needs of its members, often focusing on mutual benefit rather than maximising profit. While they offer limited liability and collective benefits, decision-making can be slower due to required participation from all members, and conflicts may impact efficiency. Cooperatives are ideal for pooling resources to achieve common goals.

2. Policies and Regulations for Marketing of Organic Produce

Policies and regulations for marketing organic produce are designed to ensure that products labelled as "organic" meet certain standards, safeguard consumer trust, and promote sustainable agricultural practices.

a) Food Safety and Standards Authority of India

The Food Safety and Standards Authority of India (FSSAI) is responsible for regulating the manufacture, distribution, sale, and import of organic foods under the provisions of Section 22 of the Food Safety and Standards Act, 2006. The regulatory framework for organic products is detailed in the Food Safety and Standards (Organic Foods) Regulations, 2017, which were notified under this Act. The details are as follows:

- i) The Food Safety and Standards (Organic Foods) Regulations, 2017, recognise two established certification systems: the Participatory Guarantee System (PGS), implemented by the Ministry of Agriculture and Farmers Welfare, and the National Programme for Organic Production (NPOP), implemented by the Ministry of Commerce and Industry.
- ii) In India, products must bear certification under the National Programme for Organic Production (NPOP) (export/domestic) or PGS India (domestic) [PGS- Participatory Guarantee System]. Products must bear the “Javik Bharat” or “PGS- Organic” logo to ensure authenticity.
- iii) Food products can be labelled as ‘Organic’ under 2 criteria:

(a) Under the NPOP system:

- A single-ingredient product that meets all specified standards can be labelled as “Organic.”
- A multi-ingredient product, where at least 95% of the ingredients are of certified organic origin, can be labelled as “Certified Organic.”

(b) Under the PGS-India system:

- A single-ingredient product that meets all required standards may be labelled as “PGS-Organic.”
 - A multi-ingredient product, where at least 95% of the ingredients are organic, may also be labelled as “PGS-Organic.”
- iv) Organic food that is sold directly to the end consumer by a small original producer or a producer organisation is exempt from certification requirements. A small original producer or producer organisation is defined as one with an annual turnover not exceeding ₹ 12 lakh.

3. Certification and Support Systems for Organic Agriculture in India

- a) **National Programme for Organic Production (NPOP):** It is governed by the Agricultural and Processed Food Products Export Development Authority (APEDA). It provides standards for organic production, processing, labelling, and marketing. The certification is mandatory for organic exports and domestic marketing under the “India Organic” label.
- b) **Participatory Guarantee System (PGS):** A cost-effective, peer-reviewed certification system for small-scale farmers, primarily for domestic markets.
- c) **Mission Organic Value Chain Development for North Eastern Region (MOVCDNER):** It promotes organic farming and market linkages in the northeastern states of India.

4. Government Schemes and Subsidies for Starting an Organic Farm

For starting an organic farming, the person should have full knowledge and information about these Government Schemes and Subsidies. The Government of India is promoting organic farming through different schemes or programmes, such as National Project on Organic Farming (NPOF), *Rashtriya Krishi Vikas Yojna* (RKVY), National Food Security Mission (NFSM), National Programme for Medicinally Significant Herbs and Flora (NPMSH&F), Himalayan Mission on Natural Ecology and Horticulture (HMNEH) and Indian Council of Agricultural Research (ICAR).

5. Scheme in the Department of Agriculture

The Department of Agriculture implements various schemes to promote sustainable farming practices, enhance crop productivity, and support organic farming methods. Some of the key initiatives include: (These given schemes are part of the umbrella scheme “Green Revolution”:

- a) Production and distribution of green manure seeds: A 25% subsidy is provided for the production and distribution of green manure seeds, which improve soil fertility and reduce the need for chemical fertilisers.

- b) Vermicompost production scheme (training): The scheme supports training farmers in vermicomposting, a natural process that produces high-quality organic fertiliser, enhancing soil health and reducing dependence on chemical fertilisers.
- c) Vermicompost production scheme (demonstrations): Demonstrations are conducted to showcase the benefits and methods of vermicomposting, helping farmers adopt sustainable farming practices.
- d) Production of NPV for prodenia control in cotton: The scheme promotes the production of Nucleopolyhedrosis Virus (NPV) as a biocontrol agent for Prodenia, a pest that affects cotton crops, offering a safe alternative to chemical pesticides.
- e) National Mission for Sustainable Agriculture (NMSA): The National Mission for Sustainable Agriculture (NMSA) aims to enhance agricultural productivity while ensuring the sustainable use of natural resources such as soil and water. The mission promotes sustainable practices, including improved crop varieties, efficient nutrient and pest management, access to credit and markets, agricultural insurance, and information dissemination. It also encourages eco-friendly technologies, energy-efficient equipment, and integrated approaches like agroforestry, crop-livestock systems, and fish farming. The National Mission for Sustainable Agriculture (NMSA) adopts a community-based approach by involving farmers in collective decision-making and resource management. Its location-specific approach tailors agricultural practices to local soil, climate, and water conditions. This ensures efficient resource use, better adoption of sustainable methods, and improved productivity across diverse agro-ecological regions in India.

6. Other Government Schemes and Subsidies

The government offers several schemes and subsidies to support agricultural growth, improve infrastructure, and promote sustainable farming practices. Key initiatives include:

- a) **Electronic-National Agriculture Market (eNAM)**: An electronic trading platform that connects farmers and traders across India, enhancing transparency and access to markets.
- b) **National Mission for Sustainable Agriculture (NMSA)**: Focuses on promoting sustainable agricultural practices, enhancing soil health, and ensuring climate-resilient farming.
- c) **Pradhan Mantri Krishi Sinchai Yojana (PMKSY)**: Aimed at improving irrigation facilities and water use efficiency, ensuring adequate water supply to farms.
- d) **The Paramparagat Krishi Vikas Yojana (PKVY)**: Launched in 2015, this initiative promotes organic farming by supporting the adoption of organic agricultural practices and ensuring certification.
- e) **Pradhan Mantri Fasal Bima Yojana (PMFBY)**: A government-sponsored crop insurance scheme designed to protect farmers from losses due to natural calamities and pests, integrating multiple stakeholders.

- f) **Gramin Bhandaran Yojna:** A scheme for building storage infrastructure in rural areas to reduce post-harvest losses and improve farmers' access to /markets.
- g) **Micro Irrigation Fund (MIF):** Provides financial assistance for the adoption of micro-irrigation systems like drip and sprinkler irrigation, improving water use efficiency.
- h) **National Project on Organic Farming (NPOF):** Promotes organic farming practices, provides technical support, and helps with certification and marketing.
- i) **PM Programme for Restoration, Awareness, Nourishment and Amelioration of Mother Earth (PM PRANAM):** It is a government initiative aimed at reducing the excessive use of chemical fertilisers and promoting sustainable agriculture in India.
- j) **National Horticulture Mission (NHM):** Supports the development of horticulture, including fruits, vegetables, and flowers, by providing financial assistance and technical support to farmers.
- k) **Rashtriya Krishi Vikas Yojana (RKVY):** It was launched in 2007 to promote holistic development of agriculture by encouraging states to increase public investment. In 2017, it was revamped as RKVY-RAFTAAR to enhance farmers' income through risk mitigation, agri-business entrepreneurship, and making agriculture a more remunerative and sustainable economic activity.

Practical Exercise

Activity 1: Exploring different types of business ownership for organic produce.

Materials Required:

1. Chart paper or poster board
2. Markers and pens
3. Reference materials (books, online resources)
4. Internet access

Procedure:

- Research and gather information about the different types of business ownership: sole proprietorship, partnership, Limited Liability Company (LLC), corporation, and cooperative.
- Use chart paper or poster board to visually organise the information.
- Create a comparison chart or diagram highlighting the pros and cons of each type.
- Present all the findings to the class, explaining how each structure can be applied to businesses in organic agriculture with suitable examples in each type.
- Discuss the implications of ownership types on taxes, organisation, and marketability for organic products.

Activity 2: Understanding government schemes and subsidies for organic farming.

Materials Required:

1. Notebook
2. Pen
3. Presentation tools

Procedure:

- Research different government schemes and subsidies available for organic farming in India, such as the National Project on Organic Farming (NPOF), *Paramparagat Krishi Vikas Yojana* (PKVY), and others.
- Create a detailed summary of each scheme, including its goals, benefits, and eligibility criteria, along with the success story under each scheme.
- Present all the findings through a PowerPoint presentation or posters, showing how these schemes can help organic farmers access resources, improve production, and market their produce.
- Discuss how the government initiatives contribute to sustainable farming practices and the growth of the organic farming sector.

Check Your Progress

A. Multiple Choice questions

1. Which of the following business structures is the most common and simplest for running a business?
 - a) Corporation
 - b) Partnership
 - c) Sole proprietorship
 - d) Limited Liability Company (LLC)
2. Which type of business ownership provides limited liability to its owners while allowing for more democratic control?
 - a) Non-profit Corporation
 - b) Limited Liability Company (LLC)
 - c) Cooperative
 - d) Sole proprietorship
3. Which of the following is NOT a feature of a Limited Liability Company (LLC)?
 - a) Double taxation
 - b) Taxed like a partnership
 - c) Limited liability
 - d) Simpler to organise than a corporation
4. What is the primary purpose of the National Programme for Organic Production (NPOP)?
 - a) To regulate organic imports only

- b) To provide standards for organic production, processing, and marketing
 - c) To promote conventional farming practices
 - d) To certify organic products for export only
5. Which of the following government schemes provides a subsidy for the production and distribution of green manure seeds?
- a) *Pradhan Mantri Krishi Sinchai Yojana* (PMKSY)
 - b) National Project on Organic Farming (NPOF)
 - c) *Rashtriya Krishi Vikas Yojna* (RKVY)
 - d) National Mission for Sustainable Agriculture (NMSA)
6. Which of the following policies promotes organic farming and market linkages in the northeastern states of India?
- a) Mission Organic Value Chain Development for North Eastern Region (MOVCDNER)
 - b) National Project on Organic Farming (NPOF)
 - c) *Pradhan Mantri Krishi Sinchai Yojana* (PMKSY)
 - d) *Paramparagat Krishi Vikas Yojana* (PKVY)
7. What is the main feature of a non-profit organisation in terms of financial benefits?
- a) It distributes profits among its shareholders
 - b) It is a tax-exempt organisation with no financial benefit for shareholders or trustees
 - c) It operates like a cooperative with democratic control
 - d) It aims to generate profit for its founders
8. Which organisation in India provides the "India Organic" certification mark for organically farmed food products?
- a) Ministry of Agriculture
 - b) Agricultural and Processed Food Products Export Development Authority (APEDA)
 - c) Ministry of Food Processing Industries
 - d) Department of Agricultural Research and Education
9. What is the main role of Participatory Guarantee Systems (PGS) in organic farming?
- a) To certify organic products for export markets only
 - b) To provide a cost-effective, peer-reviewed certification system for small-scale farmers
 - c) To promote large-scale industrial farming practices
 - d) To provide marketing support to organic produce sellers

B. Fill in the Blanks

1. In a _____, a single individual engages in a business activity without the need for formal organisation.

2. A _____ is a tax-exempt organisation formed for religious, charitable, scientific, or educational purposes.
3. The _____ is an electronic trading platform connecting farmers and traders across India to improve transparency and access to markets.
4. The _____ promotes organic farming by supporting the adoption of organic agricultural practices and ensuring certification.
5. The National Programme for Organic Production (NPOP) is governed by _____ and provides standards for organic production, processing, labelling, and marketing.

C. State Whether the Following Statements are True or False.

1. A limited liability company (LLC) enjoys the benefits of limited liability and is taxed like a partnership.
2. Cooperatives are member-owned organisations where each member has an equal vote, and profits are shared based on ownership.
3. The National Mission for Sustainable Agriculture (NMSA) focuses on promoting chemical-intensive farming to increase yields.
4. The National Project on Organic Farming (NPOF) provides technical support, certification, and marketing for organic farming practices.
5. The *Pradhan Mantri Fasal Bima Yojana* (PMFBY) aims to provide subsidies for organic certification in the domestic market.

D. Subjective Questions

1. A farmer decided to sell organic vegetables directly to consumers through a Farmer Producer Organisation (FPO) instead of using middlemen. Explain how cooperative organisations help farmers in marketing organic produce.
2. An organic food company wanted to label its packaged product as “Certified Organic.” The product contained 96% certified organic ingredients. Explain why the company is eligible to use this label under the NPOP system.
3. A small organic farmer with an annual turnover below ₹12 lakh sold vegetables directly in a local market without certification. Why is the farmer exempted from certification requirements?

What have you learned?

After completing this session, you will be able to:

- identify different types of organic farming enterprises and business ownership models involved in the marketing of organic produce;
- explain the policies, regulations, certification systems, and labelling requirements related to organic produce marketing;
- describe the role of marketing channels, government schemes, and support systems in promoting organic agriculture; and

- apply appropriate marketing strategies and institutional support mechanisms for the effective marketing of organic produce.

Session 2: Marketing Channels, Functionaries and Strategies

The term agricultural marketing is composed of two words: agriculture and marketing. The agricultural marketing system is a link between the farm and the non-farm sectors. Agricultural marketing involves the buying and selling of agricultural produce. In olden days, at the village level, almost every farmer sold his/her produce directly to the consumer on a cash or barter basis. Agricultural marketing encompasses all the functions and services used in moving the commodities from the producer to the final consumer.

1. Marketing Functionaries

Marketing functionaries in the marketing of organic produce are individuals or entities involved in various stages of the marketing process, from production to consumption. These functionaries play crucial roles in ensuring the effective distribution and availability of organic produce while maintaining quality standards and certifications. These are as follows:

- Primary Market:** In a primary market, the main functionaries are the producer, the village, or itinerant merchant, preharvest contractors, commission agents, transport agents, etc.
- Secondary Market:** In the secondary market, all the functionaries of the primary market are involved, and also the processing and manufacturing agents are additional functionaries. Financing agents, such as banks and co-operatives, also take part.
- Terminal Market:** In the terminal or export market, the commercial analyst and shipping agent also get involved in the transfer of goods. The functionaries have their own setup. They may be individuals, partners or co-operatives who may buy and sell on a ready and future basis, at a price determined by forces of demand and supply. Each functionary renders some service in the process of marketing and also earns a varying margin of profit for himself, and at the same time bears risks involved in the process.

2. Marketing Channels

Marketing channels in the marketing of organic produce refer to the pathways through which organic products move from producers to end consumers (Fig. 3.1). These channels are designed to maintain the integrity, quality, and certification of organic produce while providing fair returns to farmers. Organic products are sold in various types of outlets, such as supermarkets, in specialised shops, online, in open markets, in direct deliveries to clients, and on farms. The market is supplied by a myriad of importers, wholesalers, processors, packers and distributors. The choice

of marketing channel is mainly based on factors such as farm size, type and amount of products, and farm location.



Fig. 3.1: Types of Marketing Channels

To ensure fair pricing and timely lifting of products, growers should not depend on a single marketing channel. Also, especially for smaller farms, it is good to keep a close connection with the final clients. Such a type of relationship with the end user will allow growers to easily tackle the problems, if any, due to fluctuations in the market

3. Marketing Strategies for Organic Produce

Marketing organic produce requires tailored strategies that address consumer preferences for health, sustainability, transparency, and ethical farming practices, while also ensuring the profitability and scalability of the business. It involves promoting products in ways that connect with lifestyle choices and emphasise benefits to end-users. Some of these are:

- Product:** It refers to the goods or services offered by growers. Examples include:
 - Organic biscuits, cakes, and baked goods
 - Fresh flowers and vegetables
 - Ready-to-use organic food items
- Price:** Price is the amount consumers pay to purchase the product. Pricing strategies should reflect the quality, organic certification, and value perception of the produce, while remaining competitive in the market. Arranging subsidies to the product, growing near the consumers, using e-NAM, etc.
- Distribution:** Distribution involves the activities that make products available to consumers. Options include:
 - Local farmers' markets
 - Organic food stores
 - Online platforms and e-commerce delivery

- d) **Promotion:** This communicates the features and benefits of organic products and persuades customers to buy them. Effective promotional strategies include:
- **Social Media Marketing:** Engaging customers via social media and other platforms to build brand awareness
 - **Email and Online Marketing:** Direct communication with customers, cost-effective promotions, and newsletters. E-mail and online marketing are powerful tools for promoting organic produce, enabling businesses to connect directly with customers, build trust, and drive sales. E- Marketing is a cost-effective and powerful strategy for promoting and selling organic produce.
 - **Eco-Friendly Branding:** Labels, certifications, and packaging that highlight sustainability and ethical farming practices
 - **Exhibitions and Fairs:** Participating in organic product expos and local events to showcase products and build trust

4. Challenges in Marketing Organic Produce

Organic agriculture in India is gaining popularity due to rising consumer demand for healthy, sustainable, and ethically produced food. However, small and marginal farmers face several challenges in marketing their produce effectively. These problems can be broadly categorised into structural, informational, financial, and logistical issues.

a) Limited Market-Oriented Production

Most small and marginal farmers practice subsistence farming, producing primarily for household consumption rather than the market. Consequently, the market relies on a small number of large farmers, leading to uneven distribution of quality organic produce. High-demand areas often do not receive sufficient supply, creating inefficiencies and limiting growth opportunities for organic farming.

b) Lack of Awareness and Knowledge

Many farmers lack knowledge about scientific organic production techniques, proper use of organic inputs, and market linkages. Additionally, they are often unaware of government schemes and incentives designed to support organic agriculture. This knowledge gap restricts farmers' ability to improve yields, ensure product quality, and access profitable markets.

c) Uncertain Market Demand and Pricing

Before starting organic cultivation, farmers need assurance that their crops will be marketable, preferably at a premium price over conventional produce. The absence of guaranteed demand discourages farmers from investing in

organic farming, leading to cautious production and missed opportunities in the growing organic market.

d) Limited Access to Quality Organic Inputs

The availability of high-quality organic fertiliser, bio-pesticides, and other inputs is inconsistent. Farmers often face the risk of spurious products, which increase costs and reduce crop yield. Moreover, retail and distribution networks for organic inputs are weak, as demand remains relatively low and fragmented.

e) Storage and Transportation Challenges

Organic products are highly perishable and often seasonal, yet consumer demand is year-round. Many farmers lack access to proper storage facilities, and inadequate road connectivity and transportation infrastructure further complicate distribution. High transport costs and delays frequently reduce farmers' earnings and can lead to spoilage of produce before it reaches the market.

f) Lack of Market Information

Unlike industrial producers, small-scale farmers have limited access to market intelligence, including pricing trends, consumer preferences, and demand forecasts. Without timely and accurate information, farmers cannot negotiate fair prices or plan their production efficiently, which impacts profitability.

g) High Input and Production Costs

Organic farming requires inputs that are generally more expensive than conventional alternatives. Small and marginal farmers, who form the majority of organic producers in India, often cannot afford these inputs without financial support, creating a barrier to entry and growth in the organic sector.

The marketing of organic agriculture in India is constrained by structural inefficiencies, knowledge gaps, high costs, and logistical limitations. Addressing these challenges requires a holistic approach:

- i) Promoting farmer cooperatives and contract farming to improve market access.
- ii) Enhancing awareness and training programs for organic farming techniques and government schemes.
- iii) Strengthening supply chains for quality organic inputs and investing in storage and transportation infrastructure.
- iv) Leveraging digital platforms for market information, e-commerce, and direct consumer engagement.

- v) Providing financial support through subsidies, microfinance, and insurance schemes to make organic farming more accessible and sustainable.

By tackling these issues, India can enable small and marginal farmers to participate effectively in the organic market, reduce post-harvest losses, and meet the growing demand for organic produce.

Practical Exercise

Activity 1: Creating a presentation on marketing strategies for organic products

Materials Required:

1. Computer or tablet
2. Presentation software
3. Internet access for research
4. Images and charts

Procedure:

- Explore marketing strategies for organic products, focusing on audience, value, and trust.
- Create a slide presentation covering strategy, pricing, promotion, and distribution.
- Include title, intro, main content, and conclusion with visuals and bullet points.
- Practice for clear, confident delivery.

Activity 2: Case studies of local organic growers/ farmers

Materials Required:

1. Notebook or worksheets
2. Pen/pencil
3. Access to the internet or local community resources
4. Camera or phone (for photos during field visit)

Procedure:

- Divide the class into groups of 3–4 students. Each group selects a local farmer or small producer. Interview the farmer or observe their farm to gather details on:
 - a) Crops/products and farming methods
 - b) Marketing practices and certification (NPOP, PGS-India, Jaivik Bharat)
 - c) Challenges in production, marketing, storage, or transportation
 - d) Support received from government or cooperatives
- Identify main problems, solutions, and lessons learned.
- Prepare a short report or presentation (2–3 slides/pages) highlighting:

- a) Real-life challenges and strategies
- b) Role of certification and government support
- c) Insights for promoting sustainable farming

Check Your Progress

A. Multiple Choice Questions

1. Which of the following is a primary market functionary involved in organic produce marketing?
 - a) Commercial Analyst
 - b) Village or Itinerary Merchant
 - c) Shipping Agent
 - d) Transport Agent
2. What is the main aim of the marketing channels for organic produce?
 - a) To increase market prices
 - b) To maintain the integrity, quality, and certification of organic produce
 - c) To focus only on the domestic market
 - d) To reduce consumer demand
3. Which factor primarily influences the choice of marketing channels for organic produce?
 - a) Consumer preferences
 - b) Weather patterns
 - c) Farm size, type, and location
 - d) Government policies
4. What is the main challenge for small and marginal farmers in marketing organic produce?
 - a) High demand for organic produce
 - b) Lack of awareness and marketing linkages
 - c) Low-quality inputs available
 - d) Easy access to storage facilities
5. Which marketing tool is considered cost-effective for promoting organic produce?
 - a) Billboards
 - b) Television ads
 - c) E-mail/online marketing
 - d) Print media
6. What is a major problem faced by farmers in marketing organic inputs?
 - a) Low transportation costs
 - b) Lack of bio-fertiliser and bio-pesticide distribution networks

- c) Overabundance of organic inputs
- d) High-quality control of inputs

7. Why do farmers in India often face transportation problems?

- a) Limited transportation options for industrial goods
- b) Poor road connectivity and high transportation costs
- c) Limited transportation for perishable goods
- d) Excessive government regulations on transportation

B. Fill in the Blanks

1. The _____ system links the farm sector with the non-farm sector by facilitating the buying and selling of agricultural produce.
2. In a _____ market, the main functionaries include producers, village merchants, preharvest contractors, commission agents, and transport agents.
3. The _____ marketing strategy focuses on promoting and selling products by emphasising benefits to users and aligning with a particular lifestyle.
4. _____ marketing is a cost-effective strategy that promotes organic produce by directly connecting with customers online.
5. One major problem in agricultural marketing is the _____ nature of agricultural goods, which makes storage crucial for year-round availability.

C. State Whether the Following Statements are True or False.

1. Farmers in India often face transportation problems due to poor road connectivity, which reduces their profits.
2. Marketing organic produce requires the same strategies as marketing conventional produce, without any need for specialised approaches.
3. Lack of awareness about government schemes and organic farming techniques is a significant challenge for small and marginal farmers in India.
4. Agricultural goods need to be stored in warehouses because their production is seasonal, but they are demanded throughout the year.
5. Organic farming inputs, such as bio-fertilisers and bio-pesticides, are widely available through well-defined supply channels in India.

D. Subjective Questions

1. A small organic farmer started selling vegetables through both local markets and online platforms instead of depending on a single buyer. Explain how using multiple marketing channels can benefit farmers.
2. An organic farmer was unable to get fair prices because he lacked information about market demand and pricing trends. Explain how market information helps farmers in planning and marketing organic produce.
3. A group of organic farmers formed a cooperative to reduce transportation costs and improve market access. Explain how cooperatives help overcome marketing challenges in organic agriculture.

4. An organic food company used eco-friendly packaging, certification labels, and social media promotion for its products. Explain how these marketing strategies help attract consumers and build trust.
5. A farmer faced heavy losses because vegetables spoiled during transportation due to poor storage and road connectivity. Explain how storage and transportation facilities affect the marketing of organic produce.

What have you learned?

After completing this session, you will be able to:

- identify different marketing functionaries and marketing channels involved in the marketing of organic produce;
- explain various marketing strategies used for promoting and selling organic products;
- describe the major challenges faced in the marketing of organic produce in india; and
- suggest suitable measures and support systems for improving the marketing and distribution of organic produce.

Session 3: Organisations and Agencies Supporting Organic Produce Marketing

Various institutions, agencies, and organisations play a vital role in the promotion and marketing of organic produce. They provide certifications, guidelines, support, and market linkages to ensure that organic products meet required standards and reach consumers effectively. These include the Agricultural and Processed Food Products Export Development Authority (APEDA), National Mission for Sustainable Agriculture (NMSA), National Centre of Organic Farming (NCOF), and Mission Organic Value Chain Development for North Eastern Region (MOVCD-NER), among others.

1. Role and Functions of Agencies

Several agencies play a crucial role in promoting and marketing organic produce in India. These agencies help create market linkages, provide certification, and offer technical support to organic farmers. Below are the roles and functions of three key agencies in this space: APEDA (Agricultural and Processed Food Products Export Development Authority), NCOF (National Centre of Organic Farming), and MOVCD-NER (Mission Organic Value Chain Development in North Eastern Region). Brief descriptions of some of these agencies are given below:

a) **Agricultural and Processed Food Products Export Development Authority (APEDA):** The main role of APEDA is to build bonds between Indian producers and the global markets. APEDA undertakes counselling and briefing of potential sources on government policy and procedures. The following functions have been assigned to the authority:

- i) Development of industries relating to the scheduled products for export by way of providing financial assistance or otherwise for undertaking surveys and feasibility studies, participation in enquiry capital through joint ventures and other reliefs and subsidy schemes.
- ii) Registration of persons as exporters of the scheduled products on payment of such fees as may be prescribed.
- iii) Fixing of standards and specifications for the scheduled products for the purpose of exports.
- iv) Carrying out inspection of processing plants, storage premises, conveyances or other places where such products are kept or handled for the purpose of ensuring the quality of such products.
- v) Improving the packaging of the scheduled products.
- vi) Improving the marketing of the scheduled products outside India.
- vii) Promotion of export-oriented production and development of the scheduled products.
- viii) Collecting and publishing statistics from factory owners or relevant stakeholders involved in the production, processing, packaging, marketing, or export of scheduled products, as prescribed, on matters related to these products.

b) **National Centre for Organic Farming (NCOF):** National Centre for Organic Farming (NCOF) implements the National Project on Organic Farming (NPOF), which is a central sector scheme since the 10th Five-Year Plan. The following functions have been assigned to the authority:

- i) Promotion of organic farming in the country through technical capacity building of all the stakeholders, including human resource development, transfer of technology, promotion and production of quality organic and biological inputs.
- ii) Awareness creation and publicity through print and electronic media.
- iii) Promotion of organic farming through a low-cost certification system known as “Participatory Guarantee System”.
- iv) Organic input resource management, technology development through support to research and market development.
- v) NPOF scheme provides financial assistance through the Capital Investment Subsidy Scheme (CISS) for agro-waste compost production units, bio-fertilisers/bio-pesticides production units, development and implementation of a quality control regime, and human resource development.

- c) **Mission Organic Value Chain Development for North-Eastern Region (MOVCD-NER):** It is a central sector scheme, a sub-mission under National Mission for Sustainable Agriculture (NMSA), launched by the Ministry of Agriculture and Farmers Welfare for implementation in 8 North East states of India. The following functions have been assigned to the authority:
- To develop crop commodity-specific organic value chain and address gaps in organic crop production, wild crop harvesting, organic livestock management and processing, handling and marketing of organic agricultural products.
 - To replace the conventional farming/subsistence farming system with a local resource-based, self-sustainable, high-value commercial organic enterprise.
 - Developing commodity-specific commercial organic value chain under an integrated and concentrated approach with end-to-end facilities for production, processing, storage and marketing.
 - Development of organic facilities for collection, aggregation, value addition, processing, storage and market linkages for specific commodities requiring capital-intensive technology.
 - Creating a state-specific lead agency (Organic Commodity Board or Organic Mission) for coordinating, monitoring, supporting and financing the development and operationalisation of the entire value chain.

Practical Exercise

Activity 1: Agency role matching

Materials Required:

- Worksheet with list of agencies
- Worksheet with functions of agencies
- Pen/pencil

Procedure:

- Match each agency to its correct functions using the provided lists.
- Discuss in pairs or groups why each agency performs these functions.
- Review answers as a class and clarify any doubts.
- Summarise the key roles of each agency in promoting organic agriculture.

Activity 2: Farmer interview simulation

Materials Required:

- Worksheet with sample interview questions
- Pen/pencil

Procedure:

- In groups, simulate an interview with a local farmer or role-play scenario.
- Ask 3–5 key questions about crops, organic practices, marketing, and challenges.
- Record responses on the worksheet.
- Summarise findings and present a 1–2 minute report to the class.
- Discuss how agencies and certification systems can support the farmer.

Activity 3: Mini case study**Materials Required:**

1. Short written case study of a small farmer or producer
2. Worksheet for answers
3. Pen/pencil

Procedure:

- Read the case study carefully.
- Identify the problems faced by the farmer in production, certification, or marketing.
- Suggest which agency (APEDA, NCOF, MOVCD-NER) could provide support.
- Determine the suitable certification system (PGS or NPOP).
- Write a brief solution or strategy to improve the farmer's marketing and production.
- Present findings in 2–3 sentences to the class.

Activity 4: Poster/Chart Creation**Materials Required:**

1. Chart paper or poster board
2. Markers, crayons, or coloured pens
3. Ruler
4. Reference material or printed images of certification logos and marketing chains

Procedure:

- Create a visual flowchart showing the journey of organic produce:
Farmer → Certification (PGS/NPOP) → Agency support → Market → Consumer
- Include the roles of APEDA, NCOF, and MOVCD-NER where relevant.
- Add illustrations, arrows, and logos to make it visually appealing.
- Present the poster/chart to the class and explain the organic marketing process.

Check Your Progress

A. Multiple Choice Questions

1. What is the primary function of APEDA in the promotion of organic produce?
 - a) Certification of organic products
 - b) Development of industries related to scheduled products for export
 - c) Promotion of organic farming
 - d) Training in organic farming techniques
2. What is the key objective of the Mission Organic Value Chain Development for North-Eastern Region (MOVCD-NER)?
 - a) To promote conventional farming practices
 - b) To develop commodity-specific organic value chains in North-East India
 - c) To export organic products to international markets
 - d) To reduce the cost of organic certification
3. Which organisation provides financial assistance for the development of agro-waste compost production units?
 - a) NCOF
 - b) APEDA
 - c) MOVCD-NER
 - d) Ministry of Agriculture and Farmers Welfare
4. Which scheme under APEDA helps in the registration of exporters for scheduled products?
 - a) Capital Investment Subsidy Scheme (CISS)
 - b) National Project on Organic Farming (NPOF)
 - c) Registration of exporters of scheduled products
 - d) Participatory Guarantee System (PGS)
5. How does NCOF support organic farming through low-cost certification?
 - a) By providing subsidies for organic input
 - b) Through the Participatory Guarantee System (PGS)
 - c) By promoting export-oriented production
 - d) By offering export facilitation service
6. What is the primary goal of MOVCD-NER in terms of farming systems?
 - a) To replace subsistence farming with sustainable organic farming
 - b) To increase the yield of conventional crops
 - c) To develop infrastructure for conventional farming
 - d) To promote the export of organic products from the North-East

7. What is one of the key functions of APEDA in the organic sector?
 - a) Promoting direct sales to consumers
 - b) Fixing standards and specifications for scheduled products for export
 - c) Developing organic certification for local markets
 - d) Creating organic farming awareness among farmers
8. How does NCOF contribute to organic farming's growth in India?
 - a) By organising international trade fairs for organic products
 - b) By providing financial assistance for organic inputs
 - c) By promoting organic farming techniques and human resource development
 - d) By creating export channels for organic goods
9. Which agency is responsible for developing commodity-specific organic value chains in the North-East?
 - a) APEDA
 - b) NCOF
 - c) MOVCD-NER
 - d) Ministry of Agriculture

B. Fill in the Blanks

1. APEDA stands for _____ and plays a key role in building connections between Indian producers and global markets.
2. The _____ implements the National Project on Organic Farming (NPOF) to promote organic farming and build technical capacity in India.
3. One function of the NCOF is to promote a low-cost certification system known as _____.
4. The _____ scheme, launched by the Ministry of Agriculture and Farmers Welfare, aims to develop crop-specific organic value chains in the north-eastern states of India.
5. APEDA works on improving the _____ of scheduled products by setting standards, inspecting processing plants, and promoting exports.

C. State Whether the Following Statements are True or False.

1. APEDA is responsible for training individuals in various aspects of the industries connected with scheduled products.
2. The Mission Organic Value Chain Development for North-Eastern Region (MOVCD-NER) aims to replace subsistence farming systems with commercial organic enterprises.
3. APEDA's role includes the registration of persons as exporters of scheduled products upon payment of prescribed fees.
4. NCOF provides financial assistance to farmers for organic certification but does not assist with training or awareness creation.

5. The National Centre for Organic Farming (NCOF) focuses only on marketing organic products and does not promote organic farming inputs.

D. Subjective Questions

1. An organic spice producer wanted to export products to international markets and approached APEDA for support. Explain how APEDA helps organic producers in export promotion and quality assurance.
2. A group of farmers attended a training programme on bio-fertilisers and organic certification organised by NCOF. Explain how such programmes help farmers improve organic farming practices.
3. Farmers in a North-Eastern state shifted from subsistence farming to commercial organic farming under MOVCD-NER. Explain how this scheme supports organic value chain development and market linkages.
4. An organic food processing unit improved packaging and storage facilities before exporting products abroad. Explain why packaging, storage, and inspection are important in the marketing of organic produce.
5. A state agency collected and published data related to organic product processing and export. Explain how maintaining statistics and market information helps in promoting organic agriculture.

What have you learned?

After completing this session, you will be able to:

- identify the roles and functions of various institutions, agencies, and organisations involved in the promotion and marketing of organic produce;
- explain the contribution of agencies such as apeda, ncof, and movcd-ner in supporting organic farming and market development;
- describe the importance of certification, value chain development, packaging, storage, and market linkages in organic produce marketing; and
- explain knowledge of government schemes and institutional support systems for the effective promotion and marketing of organic products.

Answer Key

Unit 1: Harvesting And Post-Harvest Management

Session 1: Factors Affecting Harvesting and Stages of Crop Maturity

A. Multiple Choice Questions

1. b
2. a
3. c
4. c
5. b
6. b
7. c
8. c
9. b
10. b

B. Fill in the Blanks

1. Maturity
2. Ethylene
3. Starch
4. Tree shakers
5. Moisture

C. State Whether the Following Statements are True or False

1. False
2. True
3. False
4. False
5. False

Session 2: Methods and Techniques of Harvesting

A. Multiple Choice Questions

1. b
2. c
3. b
4. b
5. c

B. Fill in the Blanks

1. Manual picking
2. Mechanical
3. Mulch
4. Early
5. Biogas

C. State Whether the Following Statements are True or False

1. True
2. False
3. False
4. True
5. False

Session 3: Post-Harvest Handling and Management Practices

A. Multiple Choice Questions

1. b
2. b
3. b
4. b
5. c
6. b
7. a
8. b
9. c
10. b

B. Fill in the Blanks

1. Size, Shape
2. Trimming
3. Humus
4. Vacuum Packaging
5. Bruised

C. State Whether the Following Statements are True or False.

1. True
2. False
3. True
4. False
5. True

Session 4: Innovative Storage Practices for Organic Produce

A. Multiple Choice Questions

1. b
2. c
3. b
4. b
5. a

B. Fill in the Blanks

1. Synthetic Preservative and Pesticides
2. 0°C, 4°C
3. Composting, Vermicomposting
4. Contamination
5. 10°C, 15°C

C. State Whether the Following Statements are True or False

1. False
2. True
3. False
4. True
5. True

Unit 2: Standards and Certification in Organic Farming

Session 1: National Standards for Organic Produce and Organic Products

A. Multiple Choice Questions

1. b
2. a
3. a
4. b
5. b
6. b
7. a
8. c
9. b
10. c

B. Fill in the Blanks

1. Production, Processing
2. Organic

3. Quality
4. Synthetic chemicals
5. Recyclable, biodegradable, or Compostable

C. State Whether the Following Statements are True or False

1. False
2. False
3. True
4. True
5. True

Session 2: Inspection and Certification Procedures for Organic Produce

A. Multiple Choice Questions

1. b
2. b
3. b
4. c
5. b
6. b
7. b
8. b
9. b
10. b

B. Fill in the Blanks

1. Standards
2. Tracenet
3. Ministry of Commerce and Industry (MoCI)
4. Renewal
5. Farm

C. State Whether the Following Statements are True or False

1. True
2. False
3. False
4. True
5. True

Session 3: Documentation and Record Management

A. Multiple Choice Questions

1. b
2. b
3. b
4. a
5. a
6. b
7. b

B. Fill in the Blanks

1. Traceability
2. Planning
3. Identity preservation
4. India Organic
5. Livestock

C. State Whether the Following Statements are True or False.

1. True
2. False
3. True
4. True
5. False

Unit 3: Marketing of Organic Produce

Session 1: Types of Organic Farming Enterprises, Policies and Regulations

A. Multiple Choice Questions

1. c
2. b
3. a
4. b
5. b
6. a
7. b
8. b
9. b

B. Fill in the Blanks

1. Sole proprietorship
2. Non- profit Business

3. eNAM
4. *Pramparagat Krishi Vikas Yojana* (PKVY)
5. Agricultural and Processed Food Products Export Development Authority (APEDA)

C. State Whether the Following Statements are True or False.

1. True
2. False
3. False
4. True
5. False

Session 2: Marketing Channels, Functionaries and Strategies

A. Multiple Choice Questions

1. b
2. b
3. c
4. b
5. c
6. b
7. b

B. Fill in the Blanks

1. Agricultural Marketing
2. Primary
3. Product
4. Online
5. Perishable

C. State Whether the Following Statements are True or False.

1. True
2. False
3. True
4. True
5. False

Session 3: Organisations and Agencies Supporting Organic Produce Marketing

A. Multiple Choice Questions

1. b
2. b
3. a

4. c
5. b
6. a
7. b
8. c
9. c

B. Fill in the Blanks

1. APEDA
2. National Centre for Organic Farming (NCOF)
3. Participatory Guarantee System
4. Mission Organic Value Chain Development for North Eastern Region (MOVCD-
NER)
5. Quality

C. State Whether the Following Statements are True or False.

1. True
2. True
3. True
4. False
5. False

Glossary

Brix: It is a scale measuring the sugar content in a solution, with 1°Bx equal to 1 gram of sucrose.

Calliper Grade: A measurement of fruit size, such as the width of banana fingers, used to determine harvest readiness.

Cereal Grains: Crops like wheat and rice are typically harvested at physiological maturity with low moisture content for storage.

Dry Matter Content: The percentage of solid material in plant tissue, used to determine maturity in crops like grains.

Ethylene Gas: A natural plant hormone that regulates the ripening process in fruits like bananas, avocados, and tomatoes.

Full Ripeness: The stage where crops are at their peak quality, flavour, and appearance, making them suitable for fresh consumption.

Genetic Makeup: The inherited traits of crops, which influence growth duration and time to maturity.

Genetically Modified Organisms (GMOs): Organisms whose genetic material is artificially modified using biotechnology to introduce desirable traits like resistance or productivity.

Harvesting Equipment: Tools and machinery used to efficiently and safely gather crops, minimising labour and crop damage.

Harvesting Window: The optimal period during which crops should be harvested for the best quality and yield.

Harvesting: The process of gathering mature crops from the field. It significantly influences the quality and yield of agricultural produce.

Hybrid Varieties: Crop strains bred for specific traits like early maturity, pest resistance, or high yield.

Leafy Vegetables: Crops like spinach or lettuce, harvested at their peak tenderness before bitterness develops.

Market Considerations: Factors influencing harvest timing to meet consumer preferences or storage requirements.

Maturity Indices: Indicators that determine the readiness of crops for harvest, such as colour, size, specific gravity, or starch content.

Maturity: The stage at which a crop has fully developed and is ready for harvest, characterised by optimal size, weight, and nutritional content.

Moisture Content: A critical factor in determining harvest time, particularly for grains, to ensure proper storage conditions.

Pest and Disease Pressure: The impact of harmful organisms and infections on crop development and maturity.

Physiological Maturity: The stage when crops reach their maximum growth but may not yet exhibit full ripeness for consumption.

Post-Harvest Physiological Disorders: Issues like rotting or disease affecting crops harvested too early or too late.

Post-Ripeness: The stage where crops deteriorate in quality if not harvested on time, resulting in over-ripeness.

Pre-Harvest Stage: The period before crops are fully mature but closely monitored for harvesting readiness.

Pruning Deadwood: The removal of dead, dying, or diseased branches to improve plant health, safety, and appearance.

Pruning: The selective removal of branches, shoots, or roots from a plant to improve its structure, health, and productivity.

Ripening: A biochemical process occurring after maturity, where fruits or vegetables develop flavour, aroma, and texture suitable for consumption.

Skin Colour: A visual maturity indicator, where changes in colour signal the readiness of fruits like tomatoes or apples for harvest.

Soil Fertility: The nutrient content of the soil affects crop growth, quality, and time to maturity.

Specific Gravity: A measure of the density of a fruit or vegetable compared to water, used to gauge maturity.

Starch Content: The amount of starch in fruits like apples and pears is measured to assess their maturity.

Temperature Effects: The influence of climate conditions, where higher temperatures generally lead to earlier maturity.

USDA Organic (also EU (European Union)): These certifications ensure that food and agricultural products meet strict organic farming, processing, and labelling standards in the U.S. (Europe).

Water Supply and Irrigation: The management of water resources to ensure crops reach maturity at the right time and quality.



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